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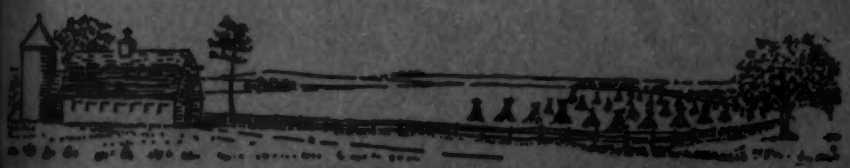

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The Farmer's Digest

Volume 13 October, 1949 Number 6

Test Your Farm Business

Condensed from Successful Farming

Lowell Hardin
Purdue University

A CHECK of 208 medium-sized farms on which records have been kept shows a wide range in yields, costs, and incomes. Some farm operators earned more than 40 percent on their investment; others didn't even make enough to break even. Where do you stand?

Lower prices for farm products and high operating costs mean a real profit squeeze is coming for the careless and inefficient farmer.

Profits from farming this year—and the years ahead—are going to be decided more than ever on the way you manage and organize your farm business. Ten years of rising prices, and most farmers have made money; many easily could have made more.

We offer here a farm-organization yardstick or standard by which you can compare your farm organization and general management. This yardstick is the result of a careful analysis of the business records from 750 Indiana farms. It includes 20 broad goals for farm organization as established by the top one-third of the diversified, medium-sized farms in the Hoosier State—goals or standards which well could apply to many farms.

If your farm business meets these standards, you likely are in the top one-third in farming efficiency and profit. If your farming organization doesn't measure up, you may want to re-examine your entire farming operations. That's what the top Indiana farm-record keepers have done. It has meant net earnings two to five times as great as those farmers in the bottom-third income group.

Organization of your farm business is determined largely by your decisions of "what-to-do." You are organizing your farm business when you decide what crops to

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Des Moines, Iowa, July 1949

raise, what livestock to produce, and what side lines, if any, you undertake. These are all management decisions.

Whether farmers realize it or not, they go through four broad steps in determining the way they farm. The first job is to size up soils, climate, buildings, markets, and the operator's abilities and preferences. The next job is to plan the right cropping program to fit those soils and markets.

The third step in the process of farm organization is to figure out whether to sell the crops directly or through various kinds of livestock. Finally, it is a continual process of checking over-all farm operations to insure a well-managed, profitable farming business. This is especially important because factors and conditions are always changing.

Of course, it takes more than a good business organization to stay in the top bracket. But the right "what-to-do" decisions are the first step on the ladder to making the farm pay.

To show how these 20 practical farm-management standards can form a yardstick for your farm, we are applying them here to a typical 160-acre Indiana farm. Before the organization of this farm was patterned after the standard, the farm was in the low one-third income group. Although the farm now is not tops for income, it does rank in the top one-third group.

This farm is shown on the accompanying chart. The old farm and its organization are shown on the left of the chart. Then the improved organization, the result after applying the yardstick, is shown on the right.

Here are the 20 farm organizational standards and a comparison of this actual farm both before and after reorganization was put into effect.

REORGANIZATION MADE THIS FARM A PROFITABLE BUSINESS

Before		After
25%	.... land in row crops	40%
50%	... land in small grains ...	20%
25%	. land in legumes, grasses .	40%
25%	. cropland bare over winter .	20%
1 per 30 acres		1 per 6 acres
	roughage users	
10%	of home-produced grain fed	90%
30%	. of time spent on livestock .	80%
10%	hogs sold September, March	80%
	productive livestock invest-	
$86	.... ment per crop acre	$54
169	total days of productive work	636
	days of productive work	
169	..... per man	318

A farm organization yardstick

In diversified Cornbelt farming areas where livestock is well adapted and well managed, here's how the top one-third of the operators usually organize their business of farming:

1. Goal: *They farm a total of 160 acres or more.*

Our demonstration farm has just that—two 80's.

2. Goal: *At least 75% of the farm is tillable.*

Our farm has 87% (140 acres) in crops.

3. Goal: *Soil productivity is built up to 55 bushels of corn or more per acre; drainage and erosion are under control.*

Our farm was producing 40 bushels; production now beats 60 bushels, after changing the rotation, the crops, and applying lime and fertilizer. Ditches were in bad condition and had to be repaired.

4. Goal: *Buildings are adequate, in good repair, but not overbuilt.*

There was a 40′ × 60′ frame barn and a 2,000-bushel crib on the farm we are comparing. A milking parlor, portable hog houses, and field cribs were added to the place, and the hen house was enlarged to greater capacity.

5. Goal: *Water is made available in most fields with as little hand labor as possible.*

After the fields were rearranged, it was a comparatively easy job to pipe water to all fields from the two wells located at the farmstead.

6. Goal: *Top farmers keep 35% or more of the cropland in corn or beans. They raise as much of these high-profit crops as they can and at the same time maintain and improve soil fertility.*

The old rotation on the farm we are discussing was only 25% corn. The new rotation is 40% corn and beans, but there's still an acre of legume sod for each acre of corn and beans. What is more, the new rotation is showing up in improved fertility.

7. Goal: *30% or less of the cropland is put in oats, wheat, other small grains.*

Small grains are limited to the acreage needed as nurse crops. Before our Indiana farm organization was revamped, the land was seeded to small grain for 2 years out of 4. This put 50% of the farm in small grains. Oats were not used as a nurse crop; the stubble was plowed for wheat. Today, the rotation calls for one crop of small grain in a 5-year rotation. That's 20%. Actually, this is the biggest change made in the cropping program.

8. Goal: *They try to have 30% or more of their cropland in legume sod. The exact acreage depends upon amount needed to maintain fertility and control erosion.*

Previously, land on this farm was seeded to clover, once every 4 years. This put 25% of the land in legumes. The new rotation calls for an alfalfa mixture left down 2 years. Today, 2 of the 5 fields are in legume sod each year or 40% of the cropland is in a higher-quality, deeper-rooted legume.

9. Goal: *The top-third farmers plan to leave only 30% or less of cropland bare (without cover) over the winter except for very level land not subject to erosion.*

On "our" farm, the old plan left only cornstalk fields bare through the winter (25%), and

our new plan does the same. Under the revised program the field going from corn to corn or beans is bare (20%). Then if oats follows instead of wheat, another field may not be covered.

10. Goal: *Farmers apply commercial fertilizer and lime according to needs as shown by soil tests.*

Formerly only the wheat was fertilized on the farm under study. Lime was needed. Complete fertilizer is now used on all crops, and 2 tons of lime have been spread per acre. The increased manure is worth mentioning, too.

11. Goal: *Uniform acreages of each crop are raised each year on the top farms.*

The old plan used a 4-year rotation (corn-oats-wheat-clover) on 2 sets of 4 fields giving uniform acreages. The new 5-year rotation—corn-corn (or beans)-oats (or wheat)-alfalfa mixture-alfalfa mixture—and 5-field layout also give equal acreages of each crop each year.

12. Goal: *Best farmers keep 1 or more roughage users, cow equivalents (a dairy or beef cow, 2 young cattle or feeders, or 7 ewes) per 10 acres.*

The old program with 3 cows and 2 horses gave 1 cow equivalent for each 30 acres. Little hay was cut. The present program, which includes 20 cows and 5 heifers, provides 1 roughage user for each 6 acres.

13. Goal: *They keep enough grain-consumers to use from 80 to 200% of the grain raised on the farm.*

Under the old plan on this farm, less than 10% of the grain produced was fed to livestock. The new livestock system takes 90%, or more, of the farm-grown grain. If a smaller percentage of this farm were tillable, it would be necessary to buy a larger proportion of the grain fed. As it is now, all the protein supplement is purchased.

14. Goal: *Enough total livestock is kept to make up 50% or more of the total work done on the farm.*

The old plan's livestock, small as it was, required 30% of all the work on the farm. Livestock in the new organization makes up 80% of the total work load.

15. Goal: *Top-notch farmers emphasize enterprises for which especially good local markets (if any) exist.*

The farm we are studying has a better-than-average outlet for whole milk and eggs, yet the old plan did little about it. Note how dairy and poultry have been expanded.

16. Goal: *Organize enterprises so that 50% to 90% of the farm products are sold during months in which prices are normally high for the season, (such as September and March for hogs.)*

The old plan did little about this. At present, fall-freshening of cows, early pullets, and intensive hog-feeding make it possible to market more than 70% of the farm products during the seasons of high prices.

17. Goal: *Thirty dollars or more is invested in productive livestock (not work stock) per crop acre.*

This investment on this farm was $6. Today it is $54.

18. Goal: *Leaders attempt to have enough productive (crop or livestock) work to keep 2 or more men busy.*

Even with 20 days of custom work off the farm, there were only 169 days of productive work per year with the old plan. Now there are 636 days—more than enough for 2 men.

19. Goal: *Top operators distribute work so a full-time labor force has productive work every week in the year.*

The old business organization on the "old" farm was only about a half-time job for one man. The new one is a full-time job for 2 men. In fact, some day-help is needed at times in addition.

20. Goal: *Top-third farmers have an average investment of $25 to $40 in farm machinery and equipment per crop acre.*

Under the old plan $32 was tied up per acre in machinery and equipment. However, some custom work was done. The present additional livestock equipment boosts the total to $38 per acre. But today there is no time to do custom work.

Of course no two farms are exactly alike. Your acreage, soils, markets, and personal likes and dislikes all may be different from the farm we have tested here. But by testing your farm's organization against the yardstick's 20 items, you can see how your farm operations stack up against those of high-income farmers.

Admittedly, good organization alone is no guarantee of low costs and high returns. Management and farm organization are a continuous process. Top-income farmers are always on the lookout for improvements they can make in their farm organization.

The question every farm family can afford to ask themselves is, "Are we in the low one-third for income when we should be in the top bracket?" This yardstick of farm standards will give you a good, reliable answer to the question.

Cutting Costs in Hog Raising

Condensed from the Farm Journal

Claude W. Gifford

WE like to call hogs "mortgage-lifters." But soon now, we may be calling them "surplus settlers."

If we run smack into a pile of grain surpluses, we'll call on our hogs to whittle down a big share of the excess. Pigs change grain into meat faster and cheaper than any other kind of livestock.

The trouble is, if enough farmers start raising more hogs the price will come down even more than it has. The big question, then, is *how can you cut costs enough to make money on these lower prices?* Here are a few of the best tricks we've been able to round up:

How to Cut Feed Costs

How much of the total cost of raising your hogs would you say goes for feed—$50, $60, or $80 out of $100? The records show that it's probably close to $80.

It's plain to see that this is the place to start slashing away at high costs. And legume pastures are your best bet. Pigs on legumes gain faster, and do it with less grain and lower costs.

Just add up what legumes give you: low cost feed; cheap proteins; plenty of vitamins; calcium minerals; and clean ground to get away from parasite losses. The pigs do most of the work, and your land gets a "shot in the arm." Every hog is a walking manure spreader, too.

But maybe you're wondering if you can afford to grow alfalfa or ladino clover instead of a cash crop like corn or wheat. Earl Grout of Washington County, Iowa, thinks you can, without losing a cent of income.

Last year Earl pastured 103 pigs on 4 acres of alfalfa-brome from April 15 to September 20, he got $150 worth of feed from each of those acres of pasture.

You can take another slice out of your costs with rape, rye, and other small-grain pastures. They stretch the "green" pasture season.

You probably know of some people who think the only way to make a dollar is not to spend a dollar. Then other folks (usually your most prosperous neighbors) are always looking for a way to

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spend a dollar to get two back. They're the ones who buy proteins.

Hogs need some animal proteins (like meat scraps, tankage, and fish meal), as well as vegetable proteins like alfalfa, soybean oil meal, and linseed meal. But hogs can't eat enough pasture or ground hay to get all the proteins they need. You've got to buy some.

Here's how to make that protein supplement dollar go farther; feed more protein when pigs are *under* 100 to 125 pounds; then taper off. In the summer you can even stop feeding proteins at 100 to 125 pounds—if your hogs are on good legume pasture, and if you're not rushing them to market.

In the winter feed a fattening ration of 6% or 7% ground legume hay; increase that to 15% to 40% in the sows' diet. Feed more minerals in winter, and always feed plenty of salt.

An amazing new feed discovery that may cut feed costs by 10% is now on the way. It's the new B_{12}. Look for this feed-saver to come on the market.

How to Save on Labor

This is the second highest cost in the hog-raising busines. Here are ways to get along with less hired help, and have more of your own time for other things:

Use large, platform self-feeders —they save feed and trips. Even pregnant sows can be self-fed if the ration includes 30% to 40% ground alfalfa hay, according to E. L. Quaife, swine specialist at Iowa State College.

Fred Doolittle and Son of Hamilton County, Iowa, self-fed their sows both before and after farrowing this year. The Doolittles say, "No more hand-feeding for us. We have 176 pigs from 20 sows. We raised them with less work, and our sows have nursed their pigs much better than when we hand-fed."

Don't haul water unless you really have to. Pipe it whenever you can. If you can't do that, use a big tank wagon and a field tank to cut down trips.

Store feed near the place where you'll feed it. What's the sense in hauling corn in from the field and then hauling it back again, asks Harry Russell, University of Illinois hog specialist

A good trick is to store corn in temporary cribs in the fields where you'll feed it later. You can even make the cribs into self-feeders.

Let the hogs do the work as much as possible. They'll mix their own feed and balance their own ration if they can get at it. "Hogging-off" can be a time- and labor-saver. Many farmers hog-off other crops as well as corn.

Have sows farrow when other work is slack. Most of the work

with hogs comes between farrowing and weaning time. Yet about 35% of the sows farrow in April, right when the busy season starts. Hog men like Robert Buck of Washington County, Iowa, who weaned 8 per litter from 39 sows last spring, have their pigs on self-feeders in pasture by April.

Use portable field houses so that you can shift your hogs and fields around in a hurry. Make 'em sturdy, but not fancy. They're good enough if they're dry and not drafty.

Handle large amounts of feed at one time. Bob Francis, Warren County, Ill., has a feed wagon with an auger and elevator that will unload a flared-box load of shelled corn in eight minutes.

These work-savers account for the fact that Purdue University folks find some farmers spending 10 hours of hard muscle work for every 100 pounds of pork they raise, and others getting by with *one or two hours* of easy labor.

Getting Bigger, Better Litters

No matter whether you raise pure-breds, crossbreds, or hybrids, the most important question is: do your sows have big litters of fast-growing pigs that put on cheap gains?

Not very many hog men would bet their whole year's income on a jack rabbit race, just because one rabbit *looked* like he could run faster than the other. Yet a lot of them pick their gilts that way.

Here are some money-making differences between sows, that you can't see by picking gilts on "good looks" alone: some sows produce less than 5 pounds of milk a day for their pigs . . . others give twice as much or more. Some have pigs that gain a half-pound a day faster than others.

Some pass on the knack for making 100 pounds of pork from less than 400 pounds of feed, while pigs from other sows need more than 500 pounds. Some sows wean 8 or 9 pigs every time—others never wean more than 5.

The thing to do is (1) pick gilts only from big, "good-doing" litters out of quiet mothers; (2) sort out the gilts that are the heaviest (and of the best quality for their age) when the shoat herd averages 125 to 140 pounds; (3) separate them from the fattening hogs and feed them a growing ration; feed 'em to be mothers, not market hogs.

Buy boars that have been picked the same way. Don't take chances on half your herd, just because a boar "looks good"; because he's available and cheap; or just because you can borrow him from your neighbor for nothing.

Give pregnant sows legume pastures (or a ration of at least 15% ground legumes in winter), some

animal proteins, minerals, and salt.

"You'd be surprised how much difference legumes make in getting big litters of pigs," says C. M. Vestal, swine-specialist at Purdue University. "We fed out two groups of gilts from 57 pounds weight here at Purdue. One lot got either alfalfa pasture or alfalfa meal right along; the other group was on dry-lot and got no alfalfa. The 13 gilts with no alfalfa weaned only 39 pigs—just three apiece. The 13 that got alfalfa weaned 91."

Saving Those Pigs

What does it mean to your pocket-book to save an extra pig per litter? Just this: a litter of five just about breaks even. You start making a profit on the sixth pig. If you have seven, your chances of profit are twice as good as when you have six.

You lose 140 pounds of feed with every little porker that dies; that's what it takes to feed him to birth. *Yet about one-third of all pigs born never get to market.* This costs us from 10% to 15% of all our hog feed.

Guard rails and pig brooders can pay for themselves with one litter. After that, the "extra-pig profits" go in your pocket. One three-year test shows that a brooder saves an average of 1½ pigs per litter.

I recently visited with a dozen top hog men in Morgan and Sangamon Counties, Ill. Their farm record books show that they are the commercial hog men in those counties who are doing an outstanding job of saving pigs. Here are some of their ideas on how to save more pigs:

See that the pigs don't get chilled the first few hours.

Give every pig a chance to suck soon after he's born.

Treat their navels with iodine.

Put fresh, clean sod in with "shut-in" pigs, starting the second day. This checks anemia.

Bed with cut straw or hay, shredded stover, chaff or leaves. (The little fellows get tangled in long bedding and get lain on). Use guard rails or brooders.

Start creep-feeding at two weeks of age (pigs need more than their mothers' milk and pasture to make a go of it).

Keep sows with pigs of about the same age together in small groups until weaning time. This cuts down robbing, which makes runts.

Castrate at 4 or 5 weeks; vaccinate at 6 or 7 weeks; wean at 8 or 9 weeks—if you do all these at once, you'll set your pigs back, and invite flu, necro, and other ailments, so these Illinois hog raisers find.

"Barnyard Gangsters"

Did you ever have termites in your pocketbook? You might as well have, if the parasite gang and disease mob move in on you.

Mange mites and lice do the dirty work on the outside, and round worms on the inside. But just one shot of benzene hexachloride will knock out the whole pack of mites and lice. Spray pigs just before weaning; the breeding stock just before breeding.

Round worms pass out just as quickly from one dose of sodium fluoride. Mix a pound to each 100 pounds of dry ground feed for one day's feeding. Mix well; don't feed it wet; and don't feed to pregnant sows.

The best thing to do is to follow the McLean County "clean ground" system: (1) scrub pens with boiling lye water or steam just before farrowing; (2) wash the sows with soap and water; (3) haul sows and pens to clean ground that hasn't been used for at least a year; (4) keep the pigs on this clean ground for at least the first four months.

Hog cholera is still our worst hog disease, and it strikes when you least expect it. One hog saved will often pay for vaccinating the whole herd.

Head Work

Management is head work. It's deciding when to buy; when to sell; how to feed; how to make the most out of what you've got. This kind of work brings in the most income.

You're a poor hog man if you're guilty of these practices found on farms where costs are high: hand-feed your hogs or haul feed every day . . . pump water by hand, or water your pigs by hand . . . string out your farrowing over a long period . . . move your hogs often . . . feed your pigs a long way from the farmstead . . . scatter your pigs over a large area . . . run hogs on the same ground year after year . . . skimp on proteins and pastures . . . and wean less than six pigs per litter.

You're a good hog man if you:

Watch the price of grains and supplements. Some hog men feed the same combination of feeds year after year. But there's no one best ration, and the alert hog man feeds whatever will give him the most for his money.

Sell the right kind of hogs, at the right time. Best prices from now on will go to medium, meat-type hogs that get to market early.

Raise both spring and fall litters if you're set up for it. Two litters get the most out of equipment, and distribute farm work, You also get two cracks at the seasonal high markets; and two hog checks a year come in handy.

Save feed by selling hogs at 225 pounds or less. The feed saved by selling 100 hogs at 225 pounds in-

stead of 300 will feed 47 extra hogs from weaning to 225 pounds. Your hogs will put on *1950 pounds more grain with the same feed.*

Keep records. One hog man in a business association recently found that he was feeding 10.3 bushels of corn and 53 pounds of supplement to get 100 pounds of pork. Another member was getting that much gain with 6.7 bushels of corn and 33 pounds of supplement.

The first fellow soon changed his hog plan—but he wouldn't have known how badly he was doing if he hadn't started keeping records.

From here on out two kinds of hog men are going to make money: the kind who cut costs to the bone; and the kind who market good hogs at the right time.

If you do both, you'll make money, even if hog prices hit the skids.

Infrared Frost Control

Back porch thermometer readings or reliance on weather bureau reports for frost warnings can be deceptive and lead to unnecessary crop losses.

At the canning tomato fields at Michigan State College, temperatures one inch above ground varied from two to nine degrees from the official temperatures recorded at the weather station only 1½ miles from the field. In one extreme case, a 10-degree variation in temperature readings at one inch above ground and three feet higher in the same location was found.

Another discovery is that there are two different types of killing frosts. One is the radiation frost caused by heat loss from the ground on calm, clear nights. The other is the windborne cold which rolls in like a tidal wave and is almost as hard to control. It generally lasts for a considerable period of time, the wind precludes the use of smudge pots or paper or cloth coverings, and the temperature drop is precipitate.

Using the new infrared frost control machine, the college is now studying the effect of infrared rays on growing vegetation. One Michigan tomato grower, who used one of the machines, reported that his protected plants were the most prolific he had ever seen, with more fruit and more nearly perfect fruit. An Indiana strawberry grower reported that the berries on which the protective infrared rays had been used produced a 25% larger yield than his unprotected patch, with fewer buttons and culls.

—N. J. Farm & Garden

Back-to-Nature Ideas in Calf Feeding

Condensed from the Ohio Farmer

Delmer E. Groves

Do you find it difficult to raise healthy calves? Almost every dairyman does. The source of some of our calf health problems may be traced to changing cattle into domestic animals. Under natural conditions many things protected the young calf's health. A number of our present calf-raising methods work against these natural forces. Nature intends the calf's rumen to do certain work. (The rumen is the place where the dry feed goes when the calf swallows it.) But the rumen can't do that work without the right tools.

Dairy calves no longer have the direct contact which used to exist with their mother. They are often kept separate from the time they are only a few days old. Current research at the Ohio Agricultural Experiment Station points to this practice as a possible stumbling block to raising healthy calves.

The experiments are being conducted by Veterinarian W. D. Pounden and Nutritionist John W. Hibbs of the dairy department. The work suggests a need for "back-to-nature" calf feeding and management. This means more roughage with less grain and milk, coupled with "cud inoculation" of calves.

The cow has a large extra compartment to her stomach known as the rumen or paunch. When she swallows dry feed this is where it goes. What goes on inside the rumen amounts to pre-digestion of the feed before it reaches the true stomach. This is done for the animal by millions of microorganisms. Actually these are extremely small plants and animals that live in the cow's rumen. It takes a microscope to see them.

These small plants and animals go by the names of bacteria and protozoa. They are mighty busy little creatures. The rumen provides them with a suitable home and a good place to work. To pay their rent, we might say, the organisms break down the feed into more suitable material for the animal. Practically, the rumen is a fermentation vat. From the feed, these little plants and animals form new products such as vitamins and proteins, which are very useful to the cow.

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Certain microogranisms are best fitted to do this work. Under natural conditions, these better-equipped varieties seem to get to the calf from its mother and other cattle. Calves become inoculated with these creatures by eating feed which has been slobbered on by cows while chewing their cuds.

Pounden and Hibbs wanted to know why so many calves were unthrifty. Among other things, they examined the contents of the rumen in very young calves. Mature cows had certain varieties of microorganisms in connection with the roughages in their rumens. These varieties were not present in most of these calves until they were many weeks old. It looked as if this could be a basic reason for some present-day calf health problems.

In the experiments two reasons were found for this difference between the rumens of the calves and cows. The first reason was that the feeds given to the calves did not favor the growth of these particular little workers in the rumens of the calves. When calves ate too much grain in proportion to roughage, the microorganisms which were present under hay feeding became very scarce and sometimes disappeared. On the other hand, if some were already present they readily multiplied when plenty of good roughage was fed.

The second reason for the lack of these microorganisms was that the calves did not have a chance to get "seed" microorganisms from older animals which were eating a lot of roughage. The transfer was prevented by the separation of the calves from the older stock. Separation is a common practice in modern dairy barns—some dairymen have a completely separate calf barn. But even where calves were kept in pens in the same barn as the cows the microorganisms frequently did not find their way to the calves' rumens. As a remedy, cuds taken from the mouths of cows were placed in the back of the calves' mouths. This assured that some of the proper bacteria and protozoa varieties would get a start in the calves.

Early in this work, experiments showed a good balance between microorganisms in the rumens of the calves when no more than half as much grain as hay was eaten. A number of calves were raised on a ration of limited milk with all the good legume hay they would eat. Starting at six weeks of age the calves were fed grain at the rate of half the amount of hay being eaten daily. Satisfactory growth was made and the health of the calves was good. The great proportion of hay in the diet showed up by a high vitamin content in the blood of the calves. Rumen action was more like that in mature cattle.

Cuds for inoculating calves are easily obtained from cows while they are chewing. This is done by quietly opening the cow's mouth and stealing part of her cud. A piece of cud can usually be found along side the tongue and premolar teeth. Small pieces of cud material are then placed in the backs of the mouths of the calves. By swallowing this piece of cud the desirable micro-organisms are carried to the rumen. Satisfactory results were obtained when this process was repeated several times during the first few weeks of the calf's life.

Rubber-covered forceps may be used instead of the hand to obtain the cud and place it in the calf's mouth. Although poor results from cud inoculations have not been seen so far, they could occur rather easily. Pneumonia, mouth and other infections possibly could be transferred from cows to calves. Certainly cuds should never be used for inoculating calves from any but healthy animals.

There is still a lot to learn about feed and management in getting an early start of mature-type rumen function in young calves. Most dairymen wouldn't think of feeding their milking cows three to four times as much grain as roughage. Yet that is exactly what they are doing with the dairy calves.

Too little emphasis is placed on roughage consumption in the feeding of young dairy calves. After all, roughage is the natural basis of the ration for ruminants. This cuts down the normal work of the rumen. It may lead to health problems or even the lack of needed vitamins. Feeding calves more grain than they need also ups the cost of raising herd replacements.

If you farm as a hobby and want more corn per acre, University of Illinois agronomists recommend a doublerow planting system which insures that every row is an outside row. From eight to 27 bushels more per acre were obtained when corn was set in alternate rows 40 inches apart, with soybeans between each row of corn. The ears were longer and bigger around and the corn stood better because the plants did not have to compete with one another for sunlight and plant food. The soybeans provide a natural source of nitrogen and are plowed back into the ground after the harvest.

Scientific Farming is Paying Off

Condensed from the Southern Planter

Robert M. Salter
Chief, U. S. Bureau of Plant Industry

FARMERS harvested the largest total crop last year ever produced on American farms. That crop reflects no important expansion of acreage. Nor was it an accident of the weather. The weather was good, to be sure, but not unusually good. Instead, last year's crop was the product of greatly increased efficiency on our farms; efficiency resulting from the adoption, to an unprecedented degree, of improved practices derived from agricultural research.

Numerous factors have contributed to this change. In general, we've had an environment favorable to the rapid adoption of more efficient crop production methods. High prices for farm products, the patriotic urge for increased production during the war, the availability of agricultural credit and of government assistance for soil conservation have all been a part of this environment. Yet all of these factors would have been ineffective had there not been available at the same time a large fund of information on more efficient methods of production and equally important large numbers of improved higher yielding crop varieties—the product of scientific research in agriculture.

Hybrid corn offers a dramatic example of scientific accomplishment in crop production. In normal growing years farmers now add at least three-quarter billion bushels of corn to their average annual crop by planting hybrid seed. The return from hybrid corn *each year* is more than 100 times the total expenditure for corn breeding research during the last *quarter century* by both the Federal and state government.

Less dramatic, but equally important, has been the increase of 15 to 20 per cent in wheat yields through the breeding of improved wheat varieties. During the same quarter century new and improved wheat varieties were developed that make possible billion bushel wheat crops.

Similar disease control progress has been made with oats, sugar beets, potatoes, tobacco, and many other crops. A new disease, helminthosporium blight,

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struck the oat crop in 1946. Last year, only three crop seasons later, there was enough seed of newly developed blight resistant varieties to supply a major part of the affected area. Unquestionably, those new varieties contributed substantially to the size of the last year's oat crop.

Much of the success in breeding for disease resistance, and in improving other desirable qualities of various crops, can be credited to foreign germ plasm supplied through our program of plant exploration and introduction. In addition, that program has to its credit the introduction into American agriculture of such major crops as soybeans and lespedeza, to say nothing of many minor crops.

During the same time that plant breeders made so much progress with new and improved crop varieties, soil scientists made significant advances in the field of soil management and fertilizers.

Research has shown us a great deal about soil acidity and how to control it; about ways to reduce erosion and to conserve water for growing crops; about the use of crop rotations, legumes and green manures for replenishing soil humus and nitrogen; and about materials, methods and machines for meeting these needs efficiently.

Our modern methods of soil classification have enabled us to transfer new information on soil and crop management from the experiment station to the individual farm.

But we still have a long way to go before we reach the optimum efficiency in soil management. One of the big potentialities lies in improving soil structure. We're learning more and more about the physical condition of the soil, its granulation and porosity. With improved soil structure plants have better roots. They make more effective use of nutrients and water. Rain water enters the soil more easily.

Research in improving soil structure is difficult but is yielding promising results. For example, recent work has been increased yields of:

1. Sugar beets from less than two tons to more than 13 tons per acre on heavy clay soils in Northwest Ohio by tillage, manure, and crop residue treatments that increased the percentage of large pores in the soil.

2. Cotton from 900 to 1,300 pounds per acre in Alabama by tillage treatments that avoided compaction and maintained the high total porosity of the soil.

3. Onions up to 310 per cent in Rhode Island by using rotations involving grasses that gave a high degree of aggregation in the soil.

4. Carrots from three to 35 tons per acre and potatoes from 12 to 258 tons per acre in Northern

Indiana by reducing the level of the water table in the soil.

We need to study the effects of our new machines on soil structure and learn to use them in ways that improve it, not injure it.

In soils covering millions of acres improvements in structure below plow depth are even more of a problem than in the plow layer. The value of increased fertility and better structure in the surface soil is seriously limited by an impermeable subsoil layer that impedes drainage, aeration, and root penetration. The improvement of this may require special deep tillage, deep liming and fertilization, and specially designed crop rotations.

On claypan soils in Missouri highly beneficial effects of sweet clover roots in opening up the subsoil were achieved where deep tillage was combined with deep placement of lime and fertilizers. Neither the tillage alone nor surface fertilization alone was effective.

The importance of deepening the effective root zone was demonstrated a few years ago in an Ohio experiment in which different fertilizer and rotation practices were used on areas: (1) from which normal soil had been removed; (2) with normal topsoil; and (3) of twice normal topsoil. Following a four-year rotation of corn, wheat, alfalfa and alfalfa on plots well limed and treated with moderate amounts of manure and mixed fertilizer corn yields on the first plot were 86.1 bushels, on the second 125 bushels, and on the third 141 bushels. The importance of deeper topsoil was unmistakable.

If we could actually deepen the topsoil, possibly by progressive deeper incorporation of adequate amounts of crop residues, manure, fertilizers, and lime where needed, we might materially increase the potentialities of the soil to grow crops.

Agricultural engineers have convinced me that we have realized no more than 50 per cent of the potential savings in labor and other costs that research on power and machinery could make possible. Let me suggest an example.

Precision planting is basic to complete mechanization of most field crops. Without accurate control of planting, the production of no crop has yet been well mechanized. A lack of precision planting has been a stumbling block with cotton, sugar beets, sugar cane, sweet potatoes, and forage legumes and grasses. One major impediment to the more rapid expansion of legumes and grass seeding in this region is the high cost resulting from heavy seeding rates. Farmers must plant many times more seed than the number of plants needed for a full stand. The difficulty is, in my opinion,

largely a lack of suitable methods for precision planting of legume and grass seed.

Our soil and crop scientists are becoming more keenly aware of the high degree of interdependence or "interaction" among the various factors that affect the growth of a crop. For example, the amount of a given nutrient element required for maximum yield is not constant but varies with the supply of other nutrient elements, with the number of plants per unit area, with the amount of water available to the crop, with the degree to which diseases and insect pests are controlled, and even with the genetic makeup of the plant itself.

This process has been the basis of recent experiments in corn culture in the Southeast. In 1944 experiments were undertaken in North Carolina to combine the plant breeders' knowledge of corn hybrids, the soil scientists' knowledge of soil types and fertilization, the crop agronomists' knowledge of time and role of planting, and the agricultural engineers' knowledge of improved methods for controlling weeds and applying fertilizer.

Corn yields in North Carolina had averaged about 20 bushels per acre. During the first year's experiment, yields of more than 70 bushels per acre were consistently produced when improved practices were applied in the proper combination. In one experiment since then the yield was varied more than 100 bushels to the acre—from 19 to 121 bushels.

Corn experiments of the same type have since been carried out in all Southeastern States with generally similar results. The best practice combinations have been worked out and recommended to farmers in each state. More than 50,000 farmers in this area have participated in demonstrations of this new method of growing corn. The average yield of all demonstrations is over 65 bushels yield to the acre. And more than 2,500 farmers have produced yields beyond the 100-bushel mark. The 1948 average corn yield for all of the Southeastern area was more than 50 per cent greater than before the new practice combinations were worked out. And only a small percentage of the farmers have started using them.

This principle of increasing production efficiently through the proper combination of improved practices is not limited to corn. Practice combinations have been worked out to produce substantially larger yields of other crops under ordinary farm conditions in the Southeast. For example, oat yields up to 85 bushels per acre, wheat yields up to 30 bushels, and soybean yields up to 35 bushels have been consistently produced in a variety of practical experiments.

We have applied the same principle in our irrigation research in the West where we are also able to control water. We've had corn yields as high as 162 bushels, grain sorghum yields as high as 174 bushels, oat yields as high as 114 bushels, potato yields up to almost 600 bushels, sugar beet yields as high as 40 tons, and alfalfa yields as high as 10 tons to the acre.

The results from these initial experiments give hope for more efficient production of many crops in many areas. Recognizing that lack of adequate high quality feeds in the South is the first limiting factor to diversification toward livestock, our bureau and the state experiment stations have under way what we hope will develop into a comprehensive research program aimed at expanding feed supplies. The program is keyed to the principle of applying new technology in combination. This approach to agricultural research appears to offer one of the real big potentialities that lie ahead.

Should Range Heifers be Bred as Yearlings?

Condensed from Farm and Home Science

J. A. Bennett, Dr. L. E. Harris, Dr. L. A. Stoddart
Utah State Agricultural College

BREEDING range beef heifers to calve at two-years of age is a common practice on many Utah ranches, but some livestock men do not breed them to calve before they are three years of age. The latter individuals believe that early calving stunts the cow, frequently results in the cow failing to calve regularly, and reduces her total lifetime returns.

In order to obtain information on this problem, the Utah Agricultural Experiment Station started a test in 1944 in Cache Valley. Typical yearling range heifers were obtained from cooperators and carried on test until the fall of 1948. Some of the heifers were placed with bulls as yearlings and the balance first as two-year-olds. All heifers were grazed on typical mountain range during the summer and wintered in the valley on hay and pasture under usual conditions for northern Utah.

Only 63 per cent of the yearling heifers that were in the pas-

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ture with the bulls became pregnant. Calving difficulties were common and several calves died at birth or shortly after. The first fall, 42 per cent of the heifers from this early-bred group weaned calves. In most cases, it was the larger heifers that became pregnant and reared calves. Generally these were the older heifers that were early-spring calves rather than late-spring calves. It is not known whether the other heifers failed to breed or if they bred but failed to settle.

Calving as a two-year-old did not reduce the calf crop the next season, nor did it seem to have a bad effect in subsequent years. At the end of their fourth calving season these early-bred cows had produced an average of 3.71 calves or the equivalent of approximately 93 per cent average calf crop per cow per year. The group that calved first as three-year-olds had at the same age completed three calving seasons with an average of 2.6 calves per cow, or approximately 89 per cent calf crop per cow per year. Part of this advantage in favor of the early calving group may be the result of the individuals in this group possessing an inherent make-up for a higher level of fertility and partly the result of the influence of calving first at a younger age.

The early calving group had, in the fall when both groups were six years old, weaned an average of 1,236 pounds of calf per cow compared to 865 pounds of calf per cow for the group that calved first at three years of age. This difference of 371 pounds in favor of early breeding resulted from the cows raising an average of 1.03 more calves per cow and also from the calves averaging 10 pounds more in weight. This heavier weaning weight is difficult to explain since the two groups of cows were of the same quality. Perhaps, by chance, the early-bred group were somewhat heavier milkers, or perhaps these cows because of calving earlier in life settled more promptly and calved slightly earlier each season, as a group.

Early breeding did not, apparently, stunt the cows. The average mature weight of the cows that raised their first calf at two years was only 8 pounds less than the average for the cows that first calved when three years of age. These cows were all reasonably well cared for during the winter season. In most cases the cows at least maintained their weight or gained slightly during the period from about October first to June first. If adequate feed had not been available, early calving would have undoubtedly reduced the size of the cows.

What Fertilizers Can Do For You

Condensed from Capper's Farmer

M. N. Beeler

MAYBE you don't like fertilizers. Maybe you say your soil doesn't need them. Maybe you think they won't do you any good. You're entitled to your opinion. Still, wouldn't it be embarrassing to do yourself out of 38,720 bushels of corn?

That's the amount you wouldn't have harvested if you had been raising 40 acres a year for 44 years on good Champaign county, Illinois, land in a corn-oats-clover rotation. And it's the amount you would have got if you had manured and fertilized the ground right along.

George Enfield, Purdue agronomist, has the best answer to anybody who objects to fertilizers: "You don't farm the same land your father did, nor do you farm the same land year after year even tho you work the same place. But you use the same old methods." By that he means the soil changes from father to son and from year to year, and the practices ought to change with the soil.

Research men have turned up results that make our prejudices against land treatments look silly. They've made fertilizers pay on land that we thought never would wear out. They've got their money back along with a sizable profit in regions where we thought only moisture was needed for bumper crops.

But these research men have got away from the old shotgun method of fertilizing. They learn first what plant foods the soil lacks and how much of each is needed to bring yields up to top possibilities for the land. They don't depend on what a neighbor or somebody else applied. Needs vary from farm to farm, field to field and even within fields. So they doctor the area that's run down with just what is required, and they don't waste any money by overdosing.

They don't guess about the places that are ailing. They test.

Take that 38,720 bushels of corn. The estimate was made from experience on the Morrow plots at the University of Illinois, from 1904 to 1947. Corn averaged 50 bushels an acre in the corn-oats-clover rotation. Manure and fertilizers applied in the same rota-

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tion made an average of 72 bushels an acre. Under the same treatment oats went up from 50 to 68 bushels, clover hay from 1.25 tons to nearly 3 tons.

The big cost in producing crops is labor and that labor is the same whether yields are high or low. So Emil Truog, Wisconsin professor of soils, says you can get more for your work if you fertilize. In Grant county, Wisconsin, an application on the furrow bottom when land was plowed made corn yield 108 bushels an acre compared with 76 bushels on untreated land. In another area the increase was from 40 to 89 bushels. In the first case the gross bonus for the same amount of work was 32 bushels and in the other, 49 bushels an acre.

The Oklahoma station put lime, manure, phosphate and potash on land in southern Payne county and made it produce 2 to 3 tons more alfalfa an acre than untreated land of the same kind. In Coal county untreated grassland made 67.6 pounds beef an acre whereas limed and phosphated grass produced 130 pounds. On eroded upland the untreated grass made 58 pounds beef an acre. Lime, phosphorus and potash brought the yield up to 94.4 pounds.

A dairyman's biggest feed costs are while cows are in the barn. A good bit of that cost comes from crop and harvest labor. He can reduce barn feeding by fertilizing pastures, says Dr. C. E. Millar, Michigan State. The applications will make earlier grass and the herd can be turned out sooner. "But," he cautions, "a man mustn't get more cattle in the flush grass season than he can graze in dry weather."

In Richland county, Wisconsin, the cost of renovating old blue grass, including lime, fertilizer, seed, labor and equipment was $16.50 an acre. During 5 years the treated pastures produced 4.4 tons more dry forage an acre than the untreated. Cost of the extra yield was only $3.75 a ton. Value of the forage above that cost was clear labor bonus. Besides that, total production was more nutritious because of the treatments. In another Wisconsin case, $15 worth of potash and phosphate an acre returned $35 in an extra yield of 15 bushels of oats and 1,595 pounds legume hay.

Corn is likely to run out of nitrogen during July and early August. That's when applications will do most good. A. L. Lang, Illinois agronomist, learned that 40 pounds of nitrogen as a side dressing at the second cultivation will do as much in increasing yields as twice that much put on at plowing or planting time.

Wisconsin farmers have been getting back $5 to $10 worth of

feed for every $1 spent on fertilizers. But they have been laying out $100,000,000 a year for feed and only $12,000,000 for fertilizers.

Even a heavy application of fertilizer may not help the corn crop in early stages if it is too deep. In Iowa 750 pounds of 8-8-8 was broadcast and plowed under. Adding 165 pounds of 3-12-12 an acre beside the hill at planting time boosted the yield 8 bushels. L. B. Nelson, Iowa State College, also points out that money may be wasted if a complete ration is not applied. Oats without fertilizer made 13 bushels an acre. Nitrogen alone made 16 and phosphorus alone made 19. But when both were applied, yield was 49 bushels.

Looking at this oats feeding another way: it would take little less than 4 acres of untreated land to make 49 bushels; about 3 acres with nitrogen alone or 2.6 acres with phosphate alone.

In Oklahoma, upland pasture was limed for 64 cents an acre. Value of beef produced on the grass was $2.84 more than that from an acre of unlimed pasture. When both lime and phosphate were applied, at a cost of $1.44 an acre, the value of beef was $7.29 an acre more than that from untreated pasture.

Ohio sugar beet growers in 7 counties boosted yields 2.5 tons an acre by plowing down fertilizer in addition to making the usual row application. The extra tonnage was made at an additional cost of $8.50 an acre.

Fertilized canning peas at New York state station yielded 750 and 1,000 pounds more an acre than unfertilized peas. An extra shot of nitrogen 60 pounds an acre, gave additional increase of 300 and 700 pounds shelled peas.

C. O. Rost, Minnesota soils man, recommends fertilizing the rotation rather than the annual crop. Under that plan, application is tailored to fit the farm and the cropping system. Then it is put on the small grain in which legume seeding is made. No other fertilizing is done until the rotation comes around again in 3, 4, 5 or more years. The single application is calculated to meet the needs of all crops grown in the round.

This plan was given a practical test in 21 Minnesota counties, with a single plant food, phosphorus. At the time all of the farms were feeding bonemeal.

Five years after the application was made, cattle were refusing to eat bonemeal. They were getting all the phosphorus they needed from the feed. There was also a big difference in crop yields. Average increase in oats for 5 years was 6.4 bushels an acre on 517 fields; barley, 4.7 bushels on 145 fields; wheat, 2.6 bushels on 187 fields; flax, 1.3 bushels on 125

fields; red clover, 0.6 ton an acre; alfalfa cut twice, 0.83 ton on 610 fields; alfalfa cut 3 times, 1.02 tons; alfalfa-brome, 0.98 ton on 64 fields. Corn which was at the tail end of the rotation and got only what phosphorus was left made 6.5 bushels more in 298 fields and matured 6 to 8 days earlier.

Some of the richest soil in the world is in north-central Iowa. Yet even it is beginning to respond to treatment. And there are spots where this proud soil will make only half a ton of alfalfa to the acre. When bare of crops the fields look as good as surrounding land, but they are sick. Apply phosphorus, says Dr. W. H. Pierre, Iowa State College. The alfalfa yield will jump up 3 or 4 times and phosphorus content of the crop will increase 40 percent. The same treatment will give 8 to 10 bushels more corn an acre. These spots may occur on flat areas where land is strongly alkaline or on eroded rolling areas.

Spot treatments also have been used in other states. In Ohio, for instance, bald knolls, thin slopes and worn hills are being brought back into production by the trashy mulch system which includes tilling, liming, fertilizing and seeding. Nonproductive areas are thus again paying their share of overhead and farm income.

Fertilizers are going west. They are invading even the dryland crop and grass regions. At the Gillette substation in Wyoming, ammonium nitrate at 160 pounds an acre increased crested wheatgrass mixed with a small amount of alfalfa by 760 pounds of hay. At the Archer substation nitrated buffalo grass was eaten greedily by sheep. Ordinarily sheep in Wyoming do not care for buffalo grass. Whether such treatments will be profitable will await further experiments.

Nitrogen fertilizers may solve the straw and stubble problems for some plains wheat growers. Heavy yields turned under or worked into the upper soil usually reduce yields of the following crop. That's because soil organisms use up nitrogen needed by the new crop in breaking down the straw. H. J. Harper, Oklahoma A & M, thinks spreading nitrate fertilizers on the straw and stubble before working may be a solution to the problemn.

Western Oklahoma farmers who cooperated with him in trying the treatments got up to 8 bushels more wheat an acre by top-dressing the previous stubble. The fertilizer was applied in July and August ahead of working the fields with a oneway. Under ordinary conditions the treated straw rotted enough by planting time so that it didn't interfere with the growth of the

new crop. Archie Godfrey, Kiowa county, applied 100 pounds of 5-12-5 at seeding time and got 5 to 6 bushels more wheat.

The King Ranch, Kleburg county, Texas, reported 40 to 67 percent more forage of higher mineral content, from phosphating range grass. In the blackland belt, Texas Experiment Station has learned that planting phosphate in the drill row with sweet clover seed will increase the growth of clover. The heavier tonnage of organic matter to turn under pays off in better cotton yields. This same method of applying phosphate with seed has been practiced several years by the station in planting vetch at Tyler.

Acorns of Industry

Condensed from Nation's Business

Robert West Howard

PALATABLE, healthy milk is as modern as the elevator and the express train. It is an American invention, just 91 years old. And, like many another invention, the whole breadth of the continent and people from every walk of life cooperated to form the roots of its beginning. The Texas war for independence, the Shakers' movement for religious expression, a Wall Street banker, immigrant ships from Europe, and the wagon trains of the California Gold Rush all played a part in enabling tall, gaunt Gail Borden to give the world its first pure, preserved milk.

The industry first met the public one February morning in 1858 when a pushcart, bearing the sign "New York Condensed Milk Company," clattered over the cobbles of New York City's Greenwich Village, its handbell tinkling an obligato to the boom of the chimes from Old Trinity. Up past the house where, only a decade before, the legend of Santa Claus had been born in Clement Moore's poem, " 'Twas the Night Before Christmas"...on past the building where, a generation hence, Thomas Edison would construct the world's first electric generating plant...around the brownstone walls of the institute where Abraham Lincoln, the gaunt Illini, orphaned by the

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pioneer scourge of milk-fever, would leap overnight to fame through the wisdom of his Cooper Union speech...on over the cobbles Gail Borden shuffled that morning, tinkling the bell that ushered in the $10,000,000,000 annual business in American milk and dairy products.

A few of the women who carried pitchers and pewter jugs out to the cart that morning stared at the syrupy, yellow fluid in the 40 quart container, pursed their lips, and turned away. Borden sighed and dug his chin a little deeper into the wool muffler each time that happened. He knew he had more than a new product to "put over." He was face to face with a revolution in public taste.

Milk, 91 years ago, was a virulent carrier of disease. Borden, himself, knew nothing about the bacteria and viruses that enabled milk to spread undulant fever, tuberculosis and plague across a city in a single day. He only knew that his own long experiments in boiling milk with sugar in a vacuum pan produced a sweet, viscous product that would not sour for weeks. Not for another generation would the French chemist, Louis Pasteur, discover that the heat used for condensation also killed most of the disease carriers in milk, while retaining the goodness in the fats, acids and proteins.

But, worst of all, Borden was fighting superstition. Most city housewives didn't know what natural milk looked like. For a half century, milk had come to them from "creameries" housed in dilapidated, manure-littered sheds beside whisky distilleries and breweries. The cows, kept in stanchions, were fed on "slops" and refuse grain that ran down troughs from the fermentation vats next door. The milk, poured into open containers in the yard, was often mixed with chalk and water in a 50–50 proportion. So, in the opinion of the city housewife, "good milk" should be a vapid blue-white.

But Gail Borden was used to opposition. His life had been a series of battles against adversity, prejudice and ignorance. Born in Norwich, N. Y., an area that was to become a center of production for the dairy industry, he followed his parents into Kentucky and Indiana on land-pioneering ventures. Professional surveyor and schoolteacher before he was 21, poor health eventually sent him to Mississippi, then west into Texas to join Stephen Austin's colony of American settlers at Galveston. He was editor of Austin's newspaper, *The Telegraph & Texas Land Register,* wrote the editorials that rallied forces for the campaign against Santa Anna.

After the Mexican War, Borden began to study the food problems confronting the immigrants who

trekked westward to the California gold fields. He invented a meat-and-flour biscuit that would keep for years, and began peddling it to the wagon trains.

A trip to the London Fair of 1851 won a blue ribbon for his meat biscuit, and hope of orders for it from British military establishments and colonists in Africa, India and Australia. Sailing home on a schooner carrying 100 immigrant families to New York, he watched the burial of several babies and children at sea . . . so reached his resolve to develop a means of preserving milk.

Repeated failures, rebuffs, bankruptcy filled the next seven years of his life. The Shaker colony at New Lebanon, N. Y., gave him shelter for a time; leaders showed him the vacuum pans they had developed for processing sugar. Here, boiling down batches of fresh milk with sugar, he developed the syrupy, golden fluid he named "condensed milk." It took another three years to convince the federal Government of his rights to a patent on the process. A chance meeting during a train ride with Jeremiah Milbank, New York banker, won him the backing to build a plant at Wassaic, N. Y., and organize a company in the fall of 1857.

He was 57 years old, a beanpole of a man with crow's-feet of worry creasing his cheeks, the morning he pushed his first cartload of condensed milk through the Greenwich Village streets. Stooped, peering nervously from door to door, he plodded on. In time, he would learn, the chimes of Old Trinity portended final success and personal peace. A crusading journalist named Frank Leslie would give him encouragement and open new markets for condensed milk later that year by running an exposé, in *Leslie's Illustrated Weekly*, of the "blue milk" yards. Leslie would extol Gail Borden's product as the only "clean" milk sold in the city. Army contractors would order thousands of cases of condensed milk for Union troops during the Civil War. Abraham Lincoln would serve it at dinner parties in the White House. Borden, himself, would retire to Texas.

In time, the filth of the "blue milk" dealers would be ended everywhere. Pasteur, using heat in another way, would invent "pasteurization" and enable the same health standards for fresh milk as those assured for the condensed product. Babcock, DeLaval, Kraft and others would open new realms of industrial processing for the dairymen. Borden's own firm would grow to an industry doing a business of approximately $600,000,000 in dairy foods and associated products. Dairying would become a business providing every American with 811 pounds of milk and cream a year.

Mulching With Wood Chips

Condensed from American Fruit Grower

A. C. McIntyre

MULCHING is gaining in popularity. Research has established the values of mulch in orchard and berry patch. Cost and availability of acceptable mulch materials are the most important limiting factors to adoption of a mulch system of culture by many growers.

Why not use wood chips for mulch? Wood chips, of a size to meet the specific requirements of the orchardist, berry grower, or nurseryman, might be the ideal mulch material.

Sawdust has been successfully used as a mulch material. Some growers have hesitated to use it or give it a fair trial for fear of its acidifying effects. In decomposition a temporary mild acidity is developed (less than occurs with peat moss) but it can easily be counteracted with a light application of lime. At the Rhode Island Agricultural Experiment Station the soil under a 6-inch sawdust mulch has, in seven years, become less acid. In the decomposition of sawdust (wood), as is the case with any cellulose material, nitrogen is used by the responsible soil organisms, thereby reducing the amount available to growing plants. Experiments have well established the fact that the reduced growth of plants under a mulch is most often associated with nitrogen deficiencies. Annual applications of 6 to 7 pounds of a nitrogenous fertilizer, such as ammonium sulfate, per mature apple tree has been found adequate when a sawdust mulch 10 inches deep has been used. Using a heavy (6-inch or more) sawdust mulch, blueberry growers have doubled the yield on measured plots.

Wood can be chipped to produce a cheap mulch material. A portable chipper is now in use that can move into the orchard and reduce prunings to chips which can be placed directly around the trees as mulch.

Limited orchard use of this chipper indicates that it can materially assist in reducing cost in disposal of prunings. In an apple orchard where no pruning had been done in several years, it was estimated that by chip-

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Cleveland, Ohio, June, 1949

ping up the prunings, cost of their disposal was reduced by more than 50 per cent.

The wood chipper can be used to provide a wood fragment of varying sizes to meet particular needs. It can readily be drawn to the wood pile or if desired it can be set up alongside each fruit tree and pole wood, obtained from the woodlot, run through it with the chips blown into place to provide any desired thickness of mulch.

About two cords of 5-inch or smaller pole wood can be run through this machine in one hour. Two cords of pole wood will produce about 4 tons of chips. Cost per hour of machine operation, two men feeding, is estimated to be $4. Thus the chipping cost per ton of chips would be $1. One man can cut and pile two cords of pole wood per day. At $1 per hour for labor, piled pole wood would be worth $4 a cord or $2 a ton. To the machine and labor cost must be added costs of hauling poles or chips to the orchard. This cost should not exceed $4 per ton, probably much less. The total cost per ton of chips thus should not exceed $7 in the orchard or berry patch.

About 300 pounds of straw per mature tree are often recommended for the initial mulching and 100 pounds per year, per tree, thereafter. If straw costs $16 a ton, the initial cost per tree would be about $2.40. For maintenance of 100 pounds a year the cost is 80 cents. To this must be added the cost of applying the mulch. In an apple orchard having 30 trees to the acre, the initial cost for straw would be $72. Adding cost of placing the straw, the per acre cost will approximate $90.

Assuming that *twice* as many pounds of chips were used as is recommended for straw, or 600 pounds, the initial cost of the wood mulch per tree would be $2.10. Cost per acre for 30 trees would be $63 or a saving of $27. Since chips will last from three to five times as long as straw, on a five-year basis the estimated savings by using wood chips should exceed $150 per acre.

Chips can be made to size so as to meet the needs of the orchardist, the nurseryman, or the strawberry grower. They represent a low fire hazard and coarse chips, ¼ inch thick and ½ to 2 inches long, will not pack tight or mat, thus allowing for desired aeration and ready entrance of rain water. On wet soils coarse chips will make an excellent roadbed and will keep soil from compacting under heavy machinery. Finally, wood chips provide an excellent soil cover, thus guarding against erosion.

Organic matter on top of our soils to protect them from beating rains and dashing surface

waters, and in our soils to give them life and stability, must be constantly used. Wood is organic matter, and wood chips offer desirable advantages as a mulch material.

Farmer Puts Irrigation on Wheels

Condensed from Kansas Farmer

Dick Mann

It took a Kansas farmer to put irrigation on wheels. The farmer is Raymond Bird, who has recently put on the market his Bird self-propelled sprinkler system which he hopes and believes will revolutionize the sprinkler-irrigation business.

You won't believe it until you see it, but Mr. Bird can start a sprinkler line at one end of a field and it will automatically move across that field under its power, sprinkling as it goes. The system can be adjusted to travel at speeds ranging from one foot to 30 feet an hour, and your field will be completely irrigated when the system reaches the far end.

Many a farmer has thought how wonderful it would be if his sprinkler system could get up and walk to a new location. Mr Bird has gone that idea one better. His system provides for a continuously moving line of sprinklers that one man can keep in operation.

Under the Bird system, a self-propelled power unit is used for each section of lateral pipe. These self-propelled power units use the principle of the old overshot water wheel. Each unit is composed of a power wheel to which is attached gallon containers, and into which water is directed thru wheel spokes to provide power by gravity.

Water is supplied to the power wheel by tapping the riser on the lateral and running the tapped water thru a timed water distributor in the hub of the power wheel. The power wheel drives a sprocket which, in turn, drives a chain that is used as a propelling track. Supplemental traction and support are provided by 2 wheels over which the chain runs.

In the demonstration held on his farm, Mr. Bird used 24 sections of 4-inch lateral pipe in 20-foot sections for a continuous line 480 feet long. Each power unit on

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the line was kept in tune with all other power units by means of synchronizing rods. These rods are standard equipment with the de luxe models and connect direct to sprocket wheel on each unit.

Each power unit has a metal arm welded to the frame at right angles to the wheels. The lateral pipe rests on this arm and is attached by means of a metal strip that fits around the pipe with sufficient clearance also to slip over the arm rest. It is then clamped into place with a single bolt.

The unit demonstrated carried the lateral at a height of 20 inches above the ground. Later models will be 30 inches high so they can be used more easily on row crops, Mr. Bird explains.

One of the problems that had to be overcome in making the Bird system practical was that of a moving supply line. Gerald Cain, a brother-in-law of Mr. Bird, invited a telescopic pipe to supply water to the moving sprinkler line. He also worked with Mr. Bird in perfecting the self-propelled power units as did other members of the Bird family.

Mr. Cain's experimental model of this telescopic supply line is a 30-foot length of 6-inch pipe with another 30 feet of 5-inch pipe encased. The back end of the smaller pipe has a metal collar. Hydraulic pressure of water flowing thru the pipe pushes the the smaller pipe ahead. When it reaches the end it is held in place by pressure against the metal collar. Mr. Cain uses a hand winch equipped with a friction brake to control the speed of the telescopic action, and to pull the pipe lengths back together when they have reached their limit of extension.

"By starting with a larger and longer pipe and graduating it down one inch at a time," says Mr. Cain, "you can have a supply line that will extend out 200 feet or more from its starting point. When you reach the end, all you have to do is to use a winch to telescope the pipe, lay your main up to that point, and start over again. This would be a job that could be done by one man."

Is the Bird system still in the experimental stage? Well, 500 power units already have been manufactured and are on the market. Mr. Bird is set up to assemble from 50 to 75 units a day on his farm. The Croft Trailer Co., of Kansas City, Denver, Spokane and Galveston, also has manufacturing rights and will be distributor for the units. The Farm Improvement Co., of Denver, is negotiating for sales rights to the system in its territory, which includes much of Kansas.

We talked to engineers and sales representatives of the Farm Improvement Company following the demonstration and they explained the possibilities of the Bird system.

The system, they say, will require only about half as much pressure as stationary systems now in operation. This will mean that less power for pumping will be needed and cheaper nozzles can be used on the line, engineers maintain.

While the Bird power units were designed for use on present sprinkler-type equipment, engineers believe they eventually will have to redesign pipes and nozzles to take full advantage of the mobile equipment. They also will need to do considerable research on spray patterns, and the problem of how much water can be distributed over a field at given speeds with various types of nozzles.

Their thinking is that speed of covering a field with self-propelled units would be a big advantage. A line moving at 30 or 40 feet an hour and putting out 1 to 2 inches of water over the area would be very desirable, they believe.

Speed of the power units in the Bird system is determined by the amount of water allowed to run into the containers during a given time. This is easily regulated, Mr. Bird explains. The distributor valve on each power unit is set like a clock. A notch on the valve is set at 2 o'clock when traveling forward. If the operator wants to reverse the direction of the line, this valve can be set back at 10 o'clock. In other words, the sprinkler line will go either forward or backward. The containers on the power wheel are turned over for reverse. That the line can go either forward or backward is important in relation to the source of water supply, and might be important in relation to prevailing winds.

How large a field can be covered at one time with the Bird system? No one knows exactly. Mr. Bird says a farmer could irrigate 320 to 400 acres with ½ mile of main and ¼ mile of lateral pipe, using his system. The length of the lateral line that could be used, he thinks, would be determined by the operator's ability to buy pipe and power units.

De luxe models of the power units are designed and built to sell for $45 each. This price includes the synchronizing rod that ties units together. Mr. Cain has not established a price on his telescopic supply pipe, as it will have to be made on order as to size and length and the cost would vary according to the needs of the buyer. He plans to manufacture the pipe in his farm shop at Sublette, Kansas.

One question most frequently asked by farmers is: "Will the system work in a muddy field?" Because of mud, Mr. Bird had his main demonstration unit set up in his pasture for the convenience of spectators. To prove that his system would work in the mud, how-

ever, he set up a smaller system in an adjoining field that was extremely muddy. Part of the unit had to go thru a sunken area containing 4 or 5 inches of water. The unit operated perfectly.

How the Bird self-propelled sprinkler system got its start makes an interesting story. Mr. Bird had wanted a sprinkler-type system for several years. One day he told the salesman he would buy a system whenever they solved the problem of having to move the lines. The salesman admitted no one had worked that out yet, but assured Mr. Bird that someone would solve the problem sometime.

After he got home Mr. Bird asked himself why he didn't do something about it personally. He immediately set to work on it and soon had a crude model of his present idea.

When you stop to think that within a few months Mr. Bird and other members of his family have seemingly solved a problem that has stumped professional engineers for years, you can appreciate what we have maintained for a long time. You can't beat the ingenuity of a farmer.

Bee Venom as Medicine

Condensed from Frontiers

Elizabeth Linn

FOUR times a year certain pharmaceutical laboratories in the United States and Canada harvest bee stings for sale to hospitals, doctors and druggists.

Bee venom has been a medicine since earliest days. Ancient bee masters gave treatments at the hive. Hippocrates, Galen and Celius wrote of the honeybee's remedial value. Pliny wrote that even bears "come from winter sleep, dull and torpid, and rob hives not for honey alone. Their eyesight is dull and for which reason they seek combs of bees, that from stinging, oppression in the head may be relieved."

Bee sting today is made as a tincture. One small bottle holds the strength of 1,000 stings. For injection use, it is put up in ampules, flame sealed. One ampule may contain the strength of one to ten stings.

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Looking like water and tasting like bananas, bee venom is also made into salve. It is put up in tablet form, tincture being mixed with whey of milk flour. Tablets are pressed by hand molds, or made by machines that emit a stream of 600 tablets a minute.

Some trade names for various bee preparations are Apis Mellifica, Apicosan, Ven-Apis, Apisin, Immenin, Emmenim, Lyovac, Forapin and Apis Viris.

Medical scientists, of course, disagree on bee medicine, as they disagree on other things. There are two sides to the bee story. Here we deal only with the affirmative and the history.

In medical libraries papers in many languages testify to human diseases treated with bee venom. Arthritis and rheumatism rank all others, but it has been used in gout, neuritis, neuralgia, sciatica, Bell's palsy, epilepsy and some types of paralysis, as well as eye and ear conditions, hay fever and asthma, general pain relief and high blood pressure.

In the laboratory girls using tweezers remove stings from gassed bees. From 1,200 to 1,500 bees are plucked in an hour. The stings and their attached venom sacs are ground up and pounded fine in mortar bowl and pestle machines.

Honeybees carry on the same intricate civilization today as when Virgil sang their virtues. In the hive live the queen and her circle of attendants. She alone lays from 1,000 to 3,000 eggs a day. Here from 500 to 2,000 male drones live in luxury. In the hive of approximately 50,000 bees, female worker bees, who never mate, make up the remaining inhabitants.

If bees are not kept, laboratories order them from hive owners. Bees run about 3,500 to the pound. The truck with its buzzing cages rolls between stone pillars of the laboratory, taking its livestock to freezing vaults. Tomorrow workers in sheepskin coats will remove stings in a temperature of from thirty-five to fifty degrees. This venom is delivered packed in ice and kept in refrigerators.

In another laboratory a corner of one cage is opened and about sixty bees are released. They fly for the light coming through the windows and men in veils pick them from the panes with hemostats. These are firmer, less pulpy, than dead bees, and easier to work with. When a bee's sting is taken, death results.

Under the magnifying glass a honey bee is a masterpiece of creation. Two shining eyes are on each side of its head and three smaller ones on top. Feelers, or antennae, are ears and nose. Its tongue, an intricate mechanism, folds back under the chin; the

jaws work cross-wise. A bee has four wings and six legs. From waist to dagger-like sting in its tail it is goldbanded.

Entire bees are used in laboratory preparations of Apis Mellifica. In the bee's small body she holds that miracle of producing royal jelly, a glandular secretion. Scientists have labored in vain to capture this elixir. Oddly, a queen bee is never born but is produced by bees feeding an ordinary female worker egg this jelly. Royal jelly, bee venom, beeswax, or honey, never have been reproduced by man.

Ancients shook up bees in alcohol or powdered their ashes. In Slavic countries they cook bees with cereals for cures. Today, American laboratories put bees in large glass-lined cans and pour alcohol, distilled water and glycerine over them. The bees are funneled into tall jars and left standing. From jars, the mixture goes to a hydraulic press. Through holes the clear liquor strains down and is collected.

Some doctors prefer to use live bees. In the doctor's office the honeybee is induced to sting the patient. The vibration of her weaving body is tremendous as she strikes home her sting. Only a Spartan keeps his seat throughout the procedure.

From the drawer in the wall the doctor takes another bee and applies it to the patient. This innocent-looking drawer has access to the rear of a beehive built into the office wall, with the bees' entrance outside. Five thousand stings may be given over a period of two years. At first, treatment is given twice weekly but only in amounts of one or two stings, until the system accustoms itself. Sometimes novacaine is injected to relieve pain.

Made up of three parts, an exterior casing and two pricked needles, the sting operates with a gliding motion partly inside the casing. The needles have teeth-like barbs. As the tip of one small needle digs beneath the skin to insert its teeth, the honeybee takes firm grip with the suction pads of her six legs. Now the second needle bites in and to the tune of her intensified buzzing, she drives in the length of her venomous sting. Angry welts around pin-like stings widen and deepen into rosy hue on the skin over the affected portions of the body.

Today's treatment is reminiscent of bygone days. The beemaster in his best clothes, we read in *The Beemaster of Warrilow,* by Tickner Edwardes, headed the outdoor procession. A cockaded footman followed carrying wraps. "Behind him walked two more, supporting a carrying chair, in which sat a florid old gentleman in a plaid shawl; behind these strode a silk-hatted man regulating the cavalcade's progress. Through

the rain of leaves, a carriage waited by the lane-side, a big old fashioned family vehicle, with champing grays.

"The procession made for the honeyhouse and all work stopped. The huge centrifugal house extracting machine ceased humming. Doors of the packing room were closed, shutting off din of hammer. On the stone floor in front of the furnace—where a caldron of honey wine simmered—a couch was set by the cherry blaze."

The little bee box waits on the table, and the now half-clothed elegant is transferred to the place of honor before the fire. His gold glasses tilt at the right angle to see every move as the beemaster opens the bee box.

The buzzing inside has gathered volume. Twelve bees dart out and make for the windowpane, where they beat their wings trying to escape into the autumn morning. The gentleman and his valet watch in trepidation. Deftly, the beemaster catches one in his fingers and brings it to the couch. With his other hand he has seized the patient in a professional, vise-like grip, ignoring the gentleman's apprehension.

"Now your lordship . . ." And the incensed honeybee stings violently, furiously twisting and vibrating. The beemaster holds poised for action another living bee. Again and again the operation is repeated while the patient cowers and whimpers on the couch. On his half-naked body the weals rise and spread, matching the florid face.

Present methods include medical tests before treatment. Often the disease for which patients seek a cure makes them allergic. As small a dose as one-tenth of a sting may be administered until the allergic person builds up immunity. It is also known there are some types of arthritis on which bee preparations have no effect.

Upon occasion a patient has unexpectedly received treatment all in one staggering dose. One fall day a cripple went hunting. In the orchard, where sun rays pointed out rows of hives, there was a clatter of metal striking against wires. In his excitement over a disappearing rabbit, the gunner forgot the fence. Honeybees streak from the hives to investigate this noisy creature who each moment becomes more entangled in the fence.

As the buzzing grows, he becomes more excited and a few bees insert disciplining stings while the fence sags and scrapes against the hives. Clusters of bees shoot from other hives to punish the unfortunate hunter. His cries rise louder. His gun is forgotton on the ground as he slaps at the bees with awkward gestures.

There is a crash as three hives topple in the sunshine and crack

apart, disgorging thousands of bees from the seething ruins of their wax cities. The air is black with them before the eyes of the trapped man. For a split minute, out of sheer terror, he waits silent as clouds of bees spatter out into individual bullets marking him for their target. His renewed screams and pleading grow incoherent as he faints and falls to the ground.

A pheasant bursts up from the meadow, sailing from the beeyard across sloping meadow, where a farmer and his son run, carrying buckets of water. The indiscriminate bees fly thick on their veils as they dash water on the hunter.

On the porch the wife removes the bees with vinegar. The stings protrude like whiskers from red flesh. While the farmer and his wife scrape them out the son telephones for the doctor. The hunter's face and body now take on a bluish tinge; his face is all but unrecognizable as the farmer forces whisky down his throat.

The average victim of so many stings would die but this man had specific immunity through his disease. After four days he was better. During these days, he was unconscious a good deal. When conscious, he was blind and experienced violent dizziness and headaches. Hot compresses and various medical remedies were administered. It was a severe siege, but when this man arose he was not crippled. He moved his arms and legs with ease for the first time in years.

Formerly it was thought that formic acid in bee venom wrought cures, but modern tests prove the absence of formic acid. A medical report states, "Bee venom contains inorganic salts, sodium, calcium, hydrochloric and phosphoric acid, volatile oils, and a very toxic base —a nitrogen free compound." Its effect is due partly to "dilating action which it exerts on small blood vessels, particularly those of joints and nerves, and improved nutrition is brought about. Bee venom paralyzes the end plates of sensory nerves and releases capillary constriction of nerve endings of the sympathetic nervous system."

Five Years of 500-bushel Clubs

Condensed from Better Crops with Plant Food

R. E. Goodin

Fieldman, Ontario Department of Agriculture

On an evening in April 1943 a small group of potato growers met in the Agricultural Office at the Village of Alliston in Ontario, Canada.

These growers had experienced good years and some not so good. In the early Thirties they had sold high-quality potatoes at 25 cents for two 90-pound bags, loaded on cars. Some of the same growers had received six dollars a bag or more after World War I. Growers could recall when seed potato certification was introduced for the first time. They could remember when the Dooley variety was introduced and became generally grown for the late crop. As time went on, this variety was replaced by Katahdin, Chippewa, and Sebago. The growers realized that diseases, such as late blight, fusarium wilt, rhizoctonia, scab, and bacterial ring rot, had periodically taken their toll. They knew that insects such as leafhoppers and aphids had become more numerous and their depredations more costly.

Their yields per acre in general had been on the decrease. With the average yield for the Province at less than 100 bushels per acre, how could anyone make money from potatoes, especially with high labour costs?

Although the meeting was called to discuss ways and means of improving the potato crop, the group easily might have broken up, because of disappointing attendance, and thus left the situation as it was. But those present were concerned about sprayers, dusters, two-row planters, weeders, pickers, storage. They knew that Simcoe county soil, particularly in the vicinity of Alliston, should be capable of profitably producing high-quality tubers.

Perhaps the answer was more organic matter, more fertilizer, better seed, improved cultural methods, and protection of the growing crop. Finally, as an encouragement to adopt these modern approved methods, a 400-bushel club was suggested as a project of the local Crop Improvement Association. The idea

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of a crop objective seemed to appeal. Why not 500 bushels per acre? The higher objective sounded well, although most growers felt that it couldn't be achieved. Rules and regulations were drafted for the South Simcoe Potato Growers 500-bushel Club, the first of such clubs to be organized in Canada.

The early announcement mentioned the following objective: "It is the desire of the committee to bring about as great an increase per acre as it is possible to obtain."

During the season, growers vied with each other; they enquired about methods being used by fellow competitors; they ventured on naming the prize winners; and visualized individual yields. At the same time, close observation and attention were given to their own crops. Neighbours took an interest. Visitors to the area were impressed with the friendly atmosphere and the lively attitudes of competitors. Finally, measurements and weights were taken; yields were calculated; and results made known at a well-attended potato growers' banquet. Three growers from a total of 24 had obtained yields slightly over the objective of 500 bushels.

Fame soon spread, and it carried a challenge. Enthusiasm was spontaneous. Growers in other areas were anxious to try their skills at producing maximum amounts of "Man's Greatest Food," on their own farms. As a result, growers in 11 counties and districts organized similar competitions, and 194 competitors finished off that fall with an average yield of 330 bushels per acre.

In the meantime, others were making preparation, and so the next year brought more competitions and more interest. Momentum increased with each succeeding year. Although statistics in this case cannot adequately convey the over-all progress in potato production, the following briefly summarizes further development.

Year	No. over 500 bu. per A.	No. over 600 bu. per A.	No. over 700 bu. per A.
1943...	3	..	..
1944...	17	4	..
1945...	3	2	..
1946...	52	6	..
1947...	41	12	1
1948...	69	18	2

The number of both clubs and competitors grew, as indicated by the following summary:

Year	No. of clubs completing contests	No. of competitors completing contests	Average yield per acre
1943	2	36	— bu.
1944	11	194	330 "
1945	12	207	266 "
1946	15	282	379 "
1947	16	275	392 "
1948	21	394	392 "

In addition to prizes for quantity, several clubs featured substantial awards for quality and selected exhibits. Following the product one step further towards the consumer, one club allotted a portion of their prize money last year to "condition of potatoes in storage." Cost of production records are kept by many and Individual Certificates of Merit are provided to each grower attaining the objective.

Potato growers' annual banquets have become popular features in the life of several potato-growing communities. Eleven such friendly get-togethers were held in 1947, with an attendance of approximately 1,500. These occasions provide opportunities for presentation of prizes, and the programme usually features outstanding speakers and entertainment. Top growers in county and district contests are eligible to compete for championship honours for the Province, based on yield per acre, quality, selection of an exhibit consisting of one bushel.

As might be expected, several important improvements in cultural and fertilizer practices have been developed as a result of these competitions. Many good growers, after plowing their clover sod in preparation for the potato crop, seed it with fall rye. Usually the rye is fertilized with 200 to 300 pounds of a complete fertilizer. This provides a fair amount of organic matter to be plowed or disked under the following spring. It serves also in retarding soil erosion. Numbers of farmers have reported less scab infestation with this practice.

More fertilizer per acre is being employed in reaching for these higher yields. Where 500 pounds of a 4-8-10 were thought to be adequate a few years ago, growers are now using 1,000 to 1,500 pounds. The top winner in 1947 used 3,200 pounds of fertilizer.

But farmers of Ontario were not content with 500-bushel Potato Clubs alone. For instance, large quantities of cereals were required, and Provincial yields were on the decrease. Statistics stated the 10-year average yield for oats in Ontario was 33.8 bushels per acre. Authorities claimed very excellent yields could be obtained from corn for grain. There was a growing export demand for turnips, but some farmers were not getting satisfactory yields. Peas for protein were being successfully grown by some, yet results were disappointing in other cases. At one time, fall wheat was an important cash crop, but interest had dwindled, perhaps largely because of low yields.

These factors led to objectives, and action. As in 500-bushel Potato Clubs, members of Crop Im-

provement Associations accepted the challenge and took the lead. Each recent year has seen an increase in organization of 100-bushel Oat Clubs, 50-bushel Barley Clubs, 1,000-bushel Turnip Clubs, 50-bushel Wheat Clubs, 30-bushel Pea Clubs, 100-bushel Corn Clubs, and recently pasture competitions have been undertaken for the first time.

The far-reaching results of these objective competitions are beyond all expectations of those who originally conceived the idea.

Set objectives per acre have become a by-word in many communities. Experience has taught many that high yields of a quality product pay dividends by reducing the production cost per unit.

Importance of Magnesium in Plant Growth

Condensed from the New England Homestead

Walter S. Eisenmenger

MAGNESIUM has recently taken on new importance as a necessary element for plant growth. Its relative scarcity has been observed in areas where commercial fertilizers, instead of farm manures, are used in part or wholly. In the countries of old civilizations its scarcity does not come to our notice for these people still use manures from animals as well as "night soil." Regions of light soil in this country, especially those which have heavy rainfall on the eastern seaboard, suffer from low content of magnesium in the soil due to the leaching effect of the rainfall. It is also true that continuous harvesting of cultivated crops hastens the appearance of magnesium deficiency much more than where crop rotation with sod is practised.

The form in which magnesium is found in the soil is important, especially with respect to the time element necessary for chemical reaction. Sulphate of magnesium (Epsom Salts) is not found naturally in areas of heavy rainfall. Dolomitic limestone is usually found in limited areas, while the silicates of magnesium are common in all parts of the earth. The speed with which these different forms react is an important factor. We at the Massachusetts Agricultural Experiment Station have used epsom salts, dolomitic limestone and finely ground soapstone on experimental plots, and

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all have served to supply magnesium for plant growth. The speed with which these compounds responded was varied. Finely ground soapstone applications were the slowest, while epsom salts were the most rapid.

The use of magnesium compounds to remedy magnesium deficiency in plants may be difficult to understand. The primordial leaves—the first to be formed—usually are the first to show symptoms of magnesium deficiency. If the plants have obtained considerable growth, the old leaves do not change their faded coloring. Only the new unfolding leaves of the bud (meristem) are improved in color when magnesium is applied as a remedy. These applications should be made very early during the growing period and preferably the corrective treatment should be made before planting the crop.

Magnesium deficiency in plants is far more in evidence during the initial growing season having abnormally heavy rainfall. Potatoes, cabbage, radishes and many other plants begin to develop the light color—chlorosis—on the lower leaves during early wet seasons. If dry weather follows, the newly unfolded leaves may show no signs of deficiency.

An explanation of this chlorosis is probably due to the leaching of magnesium from the soil almost as fast as it is weathered from minute soil particles. This weathering also takes place during periods of less rain but the magnesium is not washed out as rapidly.

It has often been asked why, within a limited area, we have evidence of magnesium deficiency and in nearby areas plants do not show magnesium deficiency. In the northeastern part of our country we can anticipate this condition when the soil has resulted from actions of glaciation during past geological eras. Soils which have been formed as a result of glacial outwash are usually, in the language of the farmer, "light and contain rounded pebbles." They show stratification and are low in colloidal matter with a tendency to be low also in magensium content.

On the other hand, soils in adjacent areas may have "pebbles" and even "rocks," but since they were not subject in the past to the action of glacial outwash, they contain an appreciable amount of colloidal matter and are usually characterized with a higher "base exchange capacity" and thus have a higher magnesium content.

It is not to be inferred that all soils that arrive from glacial lakes are deficient in magnesium, but this condition has followed in many instances.

Green coloring in plants is due

to the pigment, chlorophyll. This chlorophyll contains magnesium. When magnesium is limited in the soil, plants may show evidence of low chlorophyll content which may subsequently lead to the plant's inability to synthesize or make starches, sugars or any of the carbohydrates. Thus the ultimate result is the retardation of growth and decrease in crop yield.

Studies at the University of Massachusetts showed that red raspberries grown on magnesium-deficient plots contained less sugar than those which were grown on plots treated with magnesium. The fruit from the untreated plots was much less sweet to the taste. It is not to be assumed that chlorophyll alone contains magnesium. All plant tissue contains this element. The pigment, chlorophyll, may contain as much as 20% magnesium but 5 to 10% is the usual content. Lowly plants need the element more acutely than do seed plants.

Bacteria and fungi must have magnesium but only rarely need calcium, while seed plants need both. The fungi and other lowly plants do not use magnesium for making chlorophyll. We have numerous seed plants which suffer from low amounts of magnesium in the soil, but the deficiency is not too apparent in their chlorophyll. This is especially true of the rose family. Strawberries, blackberries, the common blooming roses, apples, plums and pears show little loss of chlorophyll on magnesium deficient soils, but the growth of these plants is greatly retarded.

It has been observed that plants needing or starving for magnesium are subject to, and become more vulnerable to other plant maladies such as increased insect infestation, other nutritional deficiencies, or plant diseases. As an example, ferns apparently do not show symptoms of chlorosis when grown on soils with low magnesium, but become covered with rust to a greater extent than do those grown on soils with normal magnesium.

The occurrence of magnesium deficiency is being regarded as a sin of omission. The deficiency is not difficult to remedy and today dolomitic limestone is used extensively. This type of lime contains magnesium in addition to calcium. Crops such as tobacco or potatoes which are not often limed may suffer. Sulphate of magnesium or epsom salts can be used with these crops to avoid the possibility of not enough magnesium for proper growth. The importance of magnesium for normal plant growth is being recognized to the extent that today some commercial fertilizer mixtures have magnesium salts added to them.

Italy's Major Land Problem

Condensed from Soil Conservation

Augusto Alfani and Hugh G. Calkins

AGRICULTURAL Italy has a little more area and a somewhat larger population than industrial Great Britain. It is not so large as California—its climatic counterpart in North America—but has three or four times as many people. Lacking many of the raw materials required for industry, the Nation must continue to rely largely on agriculture for its existence. In the last 100 years the population has doubled. With 46 million people, and increasing at an accelerated rate, a way must be found to provide bread and work for these people and to place a solid foundation under a reborn structure of democracy. Italy's African colonies, already supporting indigenous populations and containing vast areas of desert, did not furnish the complete solution, nor, with many other countries in similar predicaments, can the answer be fully found in emigration.

Whatever other measures be undertaken, it is an inescapable fact that Italy's resources of soil, water, and forest—sadly depleted by centuries of heavy use—must be husbanded with the utmost care if the Nation is to survive. Her government, her scientists, and her farmers must strive valiantly together to make every acre, on a long-term sustained basis, produce the maximum of which it is capable.

Italy has a variegated climate and a wide range of soils. It has a few large and many small valleys which are highly productive, particularly where the necessary irrigation and drainage have been provided. But the pressure of population has been such that agriculture has invaded the hills and mountains that were once clothed with forests. Extensive areas had an underlying formation of clay, or of soft rock that weathers into clay. As the forests were destroyed and the remaining vegetation was removed by grazing and cultivation, the sandy, humus-bearing soil covering the slopes was gradually removed, exposing highly erodible clay surfaces. The landscape was cut into deep gullies and knife-like ridges. Huge quantities of soil

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were washed out, destroying farms, choking stream channels, and transforming fertile river deltas into swamps and lagoons. It is quite true, of course, that these clay soils constitute only a part of Italy's conservation problem, but they are of such outstanding importance that their story and the story of the work which has been done on them is well worth the telling.

The degradation of the clay lands is a geologic process which has been unwittingly accelerated by man, impelled by necessity to make a living from the soil. Erosion has gained such momentum that man cannot hope to check it in the absolute sense. It has been demonstrated, however, that human ingenuity can use and modify natural forces in such ways as to provide tremendous benefits—not violently or suddenly, but slowly and painstakingly, taking strategic advantage of knowledge gained as the work proceeds. The jagged landscape must be shaped to fit human needs and the eroded material used to form new fields.

Cosimo Ridolfi, famed in the annals of Italian land conservation, said that the clay formation is like a miser who grasps his treasure tight in his fist; to take it away it is necessary to open the hand by force. If the force is properly applied, the farmer, like the potter, can shape the clay for his own good and for prosperity.

The troublous history of the clay lands and their destruction is not so clear as it might be. Historians have been prone to recount the wars, the progress of the arts, the political changes and the life of the cities, and to dismiss rather lightly the basic facts of agricultural development, however historically significant they might be. It can be confidently stated, nevertheless, that the Pliocenic clays were, in the main, covered with a humus-bearing layer of sandy soil and a mantle of forests. The inhabitants of the established towns and villages, often built on high hills for defensive purposes, cultivated the hills close to home. There, forests gave way to cultivation and the hills somewhat farther afield were closely grazed by domestic animals. Between 1000 and 1500 A. D. there were many wars between city republics and principalities and the natural balance was further upset by widespread burning of the forests and destruction of farming homesteads. It is entirely reasonable to suppose that many of the erosion problems inherited by the present generation originated during that epoch, in which agricultural science did not share the upsurge of art and literature. In all probability the agricultural history of the other clay formations followed very closely that of the Pliocene.

In the old days the farmers, con-

fronted by a land problem with which they were not able to cope, moved to new lands. Their former holdings, left without even the most primitive means of protection, unused except by grazing animals prone to destroy the remaining vegetation, were already prey to the forces of destruction. As time wore on and the population increased, farmers were forced to stay put and to see their lands and their livelihood ebbing away. Economically and socially, life became more complicated and difficult because not only were the hill farms destroyed but the resulting floods cut into river-valley farms and necessitated the building of expensive dikes—often of only temporary value. The silt carried to the river deltas and lower reaches created swamps and lagoons that put an end to farming and created a malaria menace to the health of the people. Present-day methods developed for using silt to build up agricultural land near river mouths, however costly, are a worth-while boon, but they can be effective in the long run only if flood flows are controlled by work extending over whole watersheds.

The necessity of soil conservation on hilly lands was recognized in Roman and even Etruscan times. Relics of stone terraces built in those ancient days are still to be found in Italy. Typical examples of this system, constantly maintained throughout many centuries, are to be found along the Italian Riviera, the shores of the northern lakes, the precipitous coast of the Gulf of Salerno around Amalfi, on the slopes of Mount Etna, and the stony lands of Tuscany.

Among the earliest records indicating recognition of the special problems of the clay lands are certain writings of Leonardo da Vinci, engineer, artist, and philosopher of the early sixteenth century, who proposed the use of methods which may be viewed as precursors of those now employed. It was not until the latter part of the eighteenth century, however, that a serious famine in Tuscany stirred the scientists of that day to devise ways and means of increasing production by extending agriculture to clay lands that had been neglected or misused. Landeschi, a parish priest, started in 1770 a system of terraces with sodded banks in sandy soil. He was closely followed by Testaferrata who introduced improvements and variations applicable to clay lands. The real father of the modern technique, though, was Cosimo Ridolfi, agricultural scientist and proprietor of the villa of Meleto, who developed a system that, in a highly perfected state, is still in use. It followed very closely the principles laid down by Testaferrata.

Briefly, this system is adapted to the venerable traditions and com-

monsense practices of Tuscany, a region in which the production of wine and olives has long been of paramount importance. The vines and trees are planted in rows between narrow fields of cereal and forage crops. Having determined that hillsides must be kept intact by building a series of ditches nearly on the contour, it was necessary to introduce a modification in the form of short, straight lines in each row to accommodate the the wires supporting the vines. The result has been a herring-bone pattern, with each ditch just above the vine-and-tree row. The ditches have just enough grade to carry the water off and allow the deposit of silt caught from the intervening fields. At intervals there are ditches on steeper grades, lined with sod, stone, or cement, which carry the surplus water to channels or catchment basins below. It should be understood that the herring-bone system cannot be employed on severely eroded clay lands until the slopes have been greatly smoothed out and moderated by a long and painstaking process. This consists primarily of building a series of small dams in each watercourse, starting at the bottom, and raising the dams as they become filled with the silt or mud washed down during rainy periods. At the same time the ridges are attacked by building ditches to accelerate erosion and hasten the filling of the dams, with the ultimate object of giving the whole terrain a shape which permits safe cultivation. At first glance, the deliberate use of induced erosion in a conservation project may seem incongruous. However, one has only to see the process in actual use to be convinced that it is logical and consistent. After all, the soil that is removed from the ridges is ultimately used for producing crops. Across every watercourse with enough width to permit farming operations there is built a series of low earth dams to impound the silt. When the process is completed and the soil has been given whatever treatment it requires to make it productive, every catchment basin is a farmed field.

Cosimo Ridolfi, who is revered by the conservation-minded scientists of Italy for his splendid work and for the wealth of written material he left behind him, was born in 1794. By 1818 he had already published his ideas about the reclamation of Tuscany's wasted clay hills. In 1828 he put forth a completely charted plan for Meleto—in the fashion of today—and from that time until his death in 1865 he was continuously engaged in improving his property in accordance with the plan. Since his death the work has been continued without interruption by his family and descendants. Under the tenantry system of Tuscany (*Mezzadria*) that means not only

that the land has been improved for its owners but also for more than 40 resident farm families.

Little by little, over a period of more than 100 years, the dream of Cosimo Ridolfi has become a reality. The work is not yet finished; there are still a few ragged banks to reclaim and a few little valleys to improve and make more fertile. Unlike other systems used in America and elsewhere, the Ridolfi method undertakes, not to stop all erosion, but to slow it down to the point where every particle of sediment that comes off a hillside can be used on more nearly level land below.

Ridolfi not only made *sistemazione* his life work but also, through his dynamic personality, inspired scientists, landowners, and practitioners to follow in his footsteps. Meleto was the model 100 years ago. Today it is a shining example of the almost-finished product.

Many other projects have been started and are now well on their way. Work at Cadiroggio in Emilia was started in 1860. In the same region an ambitious plan to improve the mountain basin of Brisighella was tentatively inaugurated in 1909, gradually gaining momentum until it became a full-fledged project in 1922. Except for the war years, it has been continuously prosecuted ever since and now makes an impressive showing. Later, extensive works which are still active were started in Val d'Era and Val d'Orcia. Other projects in clay areas have been undertaken in the region of Marche and elsewhere. In each case, advantage has been taken of experience as well as of new scientific developments. Modifications of the system have been adopted to fit local conditions, which are never the same in any two areas. It is also necessary to vary the methods to suit the demands of the local economy and the prevailing types of agriculture. One of the most interesting developments is at Brolio in the region made famous by Chianti wine. Here the Ridolfi system has been adapted to grape and olive culture on hills so rocky that the casual observer would be inclined to dismiss them as fit for nothing except a scrubby growth of woods.

Reclamation and *sistemazione* of land and water supplies are undertaken by associations of farmers known as *Consorzi,* very much like the cooperatives in certain other countries. Each *Consorzi* may have on its staff such agronomists and engineers as may be required to plan and supervise the work. No direct control is exercised by the central government but government funds may be allotted to supplement funds contributed by the members. The word "reclamation" in its broadest sense is expressed by the term

"bonifica" or *"bonifica integrale,"* which means doing all the things in an area, usually a watershed, which need to be done in order to make the land productive—erosion and torrent control, systemization of fields, pasture improvement, and reforestation—and to harness the water supplies for irrigation, flood control, and sometimes water power. This comprehensive program received considerable impetus 25 years ago but progress was interrupted by the war. Under the handicap of reduced budgets and greatly increased costs, it has been resumed. Active *bonifica* programs are under way now in various parts of Italy.

Besides land and water operations, the plan generally contemplates building a network of roads to make all farms accessible to market and houses for settlers on reclaimed portions of the area, as well as the provision of water supplies, schools, and other essential services.

The logic of control methods used may be more readily appreciated if it is realized that the clay ridges, cliffs, and banks have no soil profile—no topsoil, no subsoil, no bedrock in the usual sense. The formation is actually an extremely soft rock of great depth, usually with thin strata of sandy material. It weathers into clay or mud immediately upon exposure to the air and when the mantle of vegetation is removed is highly subject to erosion. Briefly, the objectives of the treatment are to arrest the destructive processes, to remodel the slopes, and to make the soil permanently fit for agricultural use.

The measures commonly used are:

1. To eliminate destructive flows and landslides by guiding the water in ditches built according to plan.

2. To stabilize the watercourses by the construction of dams designed to regulate the flow and cause the deposit of soil carried in suspension.

3. To remodel the slopes, achieving an "angle of repose" which permits cultivation.

The first measure is a preliminary to make the others possible. The second is started before the third, or contemporaneously with it. It generally starts with the building of a dam near the junction of the watercourse and the valley to insure rapid filling. The construction of the other dams proceeds upstream, and filling is often hastened by the process of remodeling the slopes. The lower dams frequently result in the formation of small fields suitable for farming. The process is not complete, however, until the slopes have been properly shaped. Sometimes the dams are raised several times to catch all of the silt. The third measure is accom-

plished by blasting to break down large masses of material and by hydraulic action: running rain water in ditches down the crests of small ridges to start the remodeling process and carry the surplus material to catch basins below. Ditches may also be built for this purpose across the slopes at various angles. After the rainy season, the process of rounding off the slopes and bringing them to a suitable grade is completed by hand work and ox teams. Heavy machinery, which might be used effectively in many instances, is usually not available. The action of the water, although it can properly be termed induced and guided erosion, has the special value of washing colloids and excess salts out of the soil and causing the deposit of the elements fit for tillage. From personal observation it can be stated that in some cases remodeled and tilled slopes up to 25 percent show very little erosion from rains of considerable duration and intensity, provided that drainage ditches or furrows have been properly installed.

The Importance of Lespedeza Sericea

Darrell S. Meyer

LESPEDEZA sericea has been pretty much discarded as a hay and pasture crop for our acid soils of low fertility, but recent investigations show that we have been too hasty in our judgment of this important legume. This fact is borne out by findings of soil and field crop experts who have continued to study the growth habits and characteristics of sericea. Despite the criticism surrounding this perennial Lespedeza, with understanding and proper management it has an important role to play in the agricultural picture.

Lespedeza sericea was imported into this country from Asia. The first work done with this perennial was at the North Carolina Agriculture Experimental Station in 1896. Following a typically scanty first year's growth, no further attention was given sericea. In 1900 another plot of sericea was laid out at the Arlington Experimental Farm in Virginia and again the poor showing of the first year's growth proved too discouraging for further study.

However, in 1924 the Bureau of Plant Industry brought some sericea seed from Japan and more

experimental plots were started at the Arlington Farm. More attention was given the legume at this planting. It was observed that during the first year of its growth sericea produced only a single stem above ground while an extensive root system was being developed. With favorable growing conditions, sericea literally "bloomed" during its second year. As many as twenty stems, four or five feet high, were present above ground and the root system penetrated the soil to a maximum depth of three feet. From a slow growth during its first year, this legume produced a lush vegetative growth during the second year or not later than the third year. If a cutting was made during the growing season, the new growth came from the stubble—a two or three inch stubble being best for regeneration and second growth. Field plot experiments also indicated a higher corn yield on land which had previously supported sericea for several years.

As a result of these new findings many states started growing Lespedeza sericea between 1930 and 1935 to discover how this new legume would fit into the agricultural picture in the respective states. Sericea grew well on acid soil of low fertility and liming was not necessary to establish a good growth! Further experiments were carried on to discover the worth of sericea as a hay and pasture on such soils. From a line drawn across the southern tip of Illinois, Indiana and Ohio extending to the east coast and southward to the Gulf of Mexico interest developed in the possibilities of this new legume.

Experience soon taught us that sericea had serious drawbacks for hay and pasture. As the plant matured the stems became woody and the leaves became low in proteins and high in tannin content. Both characteristics gave Lespedeza sericea a low palatability rating. Selectivity tests showed that livestock would eat sericea hay only as a last resort and many farmers said that cattle pastured on sericea showed no gain. Sericea was also susceptible to late frost. With the first warm days of late winter growth started; a frost following this brief warm spell killed that years growth. Interest in sericea lagged and farmers turned their attention to proven hay and pasture crops, such as Korean lespedeza, alfalfa and red and sweet clover. There is no question of the qualities of these more desirable crops for livestock on improved soils—but the question still remains "what can be grown on sour soils of low fertility for hay and pasture, where alfalfa and clover and Korean lespedeza will not do well?"

Despite its drawbacks, Lespedeza sericea still seems to be the

answer! As studies continue and more knowledge is acquired of sericea, certain facts become apparent and point the way to useful utilization of this plant. For instance, if sericea is cut when twelve or fifteen inches high it will produce palatable hay. For pasture sericea is most palatable when four to six inches high. Sericea is very drought resistant, too. With its deep and massive root system this legume can draw up available moisture from the subsoil during dry spells. This is an important factor to remember when considering harvestable crops.

It is becoming more and more apparent that sericea is very important as a soil builder. In varying degrees, soil building is a characteristic of every legume, but Lespedeza sericea ranks at the top—some authorities have said it is on a par with alfalfa and red clover in this respect. Sericea is easily established and maintains itself well on badly eroded and nitrogen deficient soils. Within a few years there is a dense vegetative cover present on eroding soils—further damage to the land is checked considerably or completely. The soil is held in place.

The beneficial effects of sericea do not stop at this point. The dense cover breaks the fall of rains which now fall to the ground with spent force. Because sericea is a herbaceous legume, with a great number of leaves, each year's growth dies back to the ground after the first killing frost. The depth of the litter, or organic matter, on the ground increases rapidly. This litter absorbs and holds the rainfall, letting it slowly percolate into the ground. Rapid runoff of excessive rains is stopped; the moisture is held within the soil where it is constantly available for immediate use.

This important percolation of surface water is aided by the impressive root system of sericea; a maze of roots which even penetrates the hard clay subsoils and affords many minute passageways for absorption of surface water. The tight subsoil is made porous up to depths of three feet. A new reservoir for water is created.

At the same time Lespedeza sericea is actually restoring the fertility of the depleted soil. By the same roots, nutrients are drawn up from the subsoil and later deposited upon the surface with the organic matter. All this time, nitrogen is being fixed in the soil. And sericea presents no fire hazard during the critical dry seasons. It is difficult to kindle a blaze in sericea and the flame cannot be maintained unless other dead vegetation of more incendiary nature is present. Sericea is relatively resistant to low winter temperatures. Once a stand is established on eroded soils, adverse winters and winter heaving will do relatively little damage.

Lespedeza sericea is hardy. It checks erosion. Sericea literally supplies water to the soil by checking runoff and making available seepage channels. Organic matter, nutrients and nitrogen are added to the topsoil from which they were robbed by erosion. By these qualities, Lespedeza sericea is proving itself to be a truly important soil building legume.

Capons Are Something Special

Condensed from the Poultry Tribune

CAPONS have been produced for centuries wherever poultry has been raised.

These unsexed birds have palatable soft flesh. Upon reaching their mature size, they do not take on the characteristics of the normal male. Their flesh remains soft, and fat replaces the normal tough connective tissue that develops in true males.

There is always a ready market for capons, both local and in the centralized live-poultry markets. The word capon has always indicated the best in poultry flesh, and at the present time there is a great demand for these fancy table birds. Usually weighing 5 to 6 pounds dressed, they are ideal for serving in the home on special occasions, and they are especially in demand by hotels and restaurants for serving banquets, as well as for that "something special" on the regular menu.

Recently a capon producer received the following replies to his inquiries on marketing possibilities from restaurants, hotels, and poultry buyers.

A well-known hotel wrote: "If capons were available, we would be pleased to offer them on our menu more regularly than at present. We have been fortunate enough to secure them occasionally, and when they are on the menu we have noticed that many of our guests prefer them to other meats or fowl."

Another hotel replied as follows: "We certainly favor serving them in our restaurants and would appreciate being able to obtain them in our vicinity."

A poultry processing company had this to say: "Prime capons find a ready market at premium prices during all seasons."

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One important advantage of capon production is that a medium weight bird is produced that is larger than the common roaster and smaller than a turkey. Usually capons produced from the common breeds, such as the New Hampshire, Rhode Island Red, Plymouth Rock, or crossbreds, within these breeds will weigh approximately 6 to 9 pounds alive.

Capons are not as efficient meat producers as some of the other classes of poultry. For this reason, during the war capon production on the whole was discouraged.

Now with a large potential market for these fancy, fat, roasting birds, there has been a decided increase in capon production. This is especially true among smaller poultry producers, although flocks of several hundred birds are not uncommon.

Common objections that one hears to caponizing are: 1. The cost of caponizing; 2. The greater length of time the birds must be held before marketing; and 3. Birds are sometimes killed during the caponizing operation. Also, there is always a certain percentage of "slips," these being birds on which the operation was not complete. Such birds tend to revert to normal male characteristics.

Recently some of these objections have been overcome. It is now possible to purchase started capons. These male birds are caponized when two to three weeks of age and are then held by the hatcheryman or caponizer until they are well started. This is one way in which the risk of caponizing is greatly reduced. They are available in various breeds and at various ages to suit the preference of the buyer.

When male birds are caponized by the grower, the operation usually is performed when they weigh 1 to 1½ pounds and are 5 to 6 weeks of age. Any of the general purpose heavy breeds are quite satisfactory for capons, but it is necessary to secure good stock.

After selecting stock, clean range is the next thing of importance. Capons usually do best when they are completely segregated from all other stock, especially older cockerels. Range shelters or colony houses provide good shelter. Green range with plenty of feed and water is ideal. Roosts are not necessary or desirable. Wire floors may be used in a range shelter, while a layer of thick litter is desirable on the colony house floor.

Regular feeding of a high grade ration is important. Capons usually are ready to market when 26 to 28 weeks of age, and it is this longer feeding period that increases the cost. There is no

advantage, according to most capon producers, in feeding a high protein ration such as is commonly used for broilers or roasters. In fact, the best capons are produced when fed the same as range reared pullets. Later on, when five to six months of age, they should be supplied with all the grain they need, plus a milk supplement to add a desirable finish to the carcass.

It is necessary to have a market available to dispose of the capons quickly after they have reached marketable weight and age. For instance, at the Missouri Experiment Station, it took 39 pounds of grain and mash to grow capons to 28 weeks of age. To hold the birds until 32 weeks of age took six pounds more feed per bird and only one-half pound was gained for the extra four weeks of feeding. This emphasizes the necessity of disposing of the birds as quickly as possible after they reach a marketable weight.

As a general rule, the producer who caters to a fancy local market will get the maximum returns from his birds. Prices usually run slightly higher than those for turkeys.

Producers raising capons in small numbers, usually market direct to consumers. Chicks hatched in April will be ready for the Thanksgiving market. They can be dressed, drawn, and frozen for direct shipment to consumers a considerable distance from the farm. Most producers get their greatest returns from the marketing of a fully dressed and drawn bird.

In some areas in the middle western states where there is a plentiful supply of cheap feed, certain produce buyers in the past have encouraged capon production on a rather large scale. Such buyers have available a fancy market and thereby can offer a premium over the price paid for other classes of poultry.

Crabgrass in your alfalfa? Maybe it's your own fault!

In some areas, farmers take for granted that their last cutting of alfalfa will be nearly half crabgrass. Early cuttings, which have few weeds, seem to justify their loss of a large part of the late summer crop. And few farmers ask questions as to how this loss comes about.

Last fall, however, on Washington University's Brookhill Farm in Pike County, Missouri, it was shown how crabgrass and its companion, witchgrass, can get their hold on a field of alfalfa.

A 20-acre field, which had been producing good crops of alfalfa for 4 years, was cut twice in 1947. A third cutting was not made because dry conditions caused a lack of growth. When the fall rains began, the solid green of the late alfalfa brightened the lower 10 acres of the field.

But in the upper 10 acres, paths of ripening crabgrass and witchgrass cut the field into a striped pattern of green and white. The contrast between the two parts of the field was definite.

The only difference in the treatment of the two parts of the 20-acre field was this: For the first cutting, the upper half was mowed 10 days earlier, on June 5 instead of June 15. Facts learned from the men who did the work made it clear that these 10 days meant the difference between soft and solid ground.

The spring was late and wet. Both alfalfa and bromegrass were beginning to bloom before machines could get near the field. When the attempt to bale finally was made, the wheels of the equipment sank into the ground and cut tracks down the field. Upon close examination in the fall, these tracks still could be found at the center of the grassy strips. The disturbed and puddled soil provided the seeds of crabgrass with a suitable place to germinate, and discouraged the growth of alfalfa and brome.

The combined effects of injury and competition by crabgrass may well be factors leading to the rapid decline of the alfalfa stand. Normally, the cause of crabgrass invasion is not so easy to observe. But many times less striking cases are due, no doubt, to the same two factors.

It would seem that the way to avoid loss of part of the fall hay crop, and possible permanent injury to the stand, would be to leave soft fields strictly alone. This in spite of the danger of lodging and the risk of getting course hay of poorer quality.

—*Successful Farming*

Clocking Dairy Farmers

Condensed from the Jersey Bulletin

S. R. Winters

THE New York State Agricultural Experiment Station has clocked the time-consuming steps of dairy farmers.

This was an inquiry into the relative efficiency of 22 average dairy farms. Some of them were employing outmoded methods of half a century ago; others were using labor-saving means in milking and doing other chores around dairy barns. Milking with machines was such a variable factor that on some farms the time consumed was less than four minutes to the cow, whereas on other farms as much as eight and one-half minutes were devoted to each cow.

Every step of dairying on these 22 farms was clocked with the precision of a chronometer. Records were tabulated at each dairy barn— a keeping of the score for comparison as to the relative efficiency of each dairyman in making each step count. Some farmers performed their chores with the efficiency of a modern factory; while others were doing the same job in the time-wasting manner of 1900 vintage.

One dairyman utilized 103 hours to the cow on his herd of 38; another farmer spent twice as many hours on a herd of equal size. For every hour of labor per cow, the efficient dairyman got 93 pounds of milk; as contrasted with 46 pounds for the farmer practicing outmoded methods. It cost the efficient dairyman $1.86 to produce 100 pounds of milk, while the inefficient dairyman spent $2.96 to obtain an equal volume of milk.

Of the 22 dairy farms subjected to this searching inquiry, only five of them used machines in milking all of their cows. Yet milking machines were available. In excess of 10% of the cows in the 22 herds were milked by hand. As pointed out above, the milking time varied from 4 to 8½ minutes for each cow.

Milking, cleaning the utensils, and similar duties consumed about one-half of the time spent in the dairy barn. Thus, it is pointed out, the introduction of time-reducing means would be especially profitable in this angle of dairy operations. For instance,

Reprinted by permission from the Jersey Bulletin, Indianapolis, Indiana, May 25, 1949

an hour a day could be saved on the 22 farms by reducing the milking time only two minutes to the cow. Also, oddly enough, it was observed that one of the most injurious diseases to dairy cattle, bovine mastitis, appears less frequent when fast milking is practiced.

Professor Roger G. Murphy of the New York State Experiment Station has drawn some positive conclusions and useful object lessons from this inquiry.

Improved milking means a saving of time and greater efficiency.

Faster milking is synonymous with better milking. One skeptical dairyman doubted that cows could be coaxed to yield their milk in less than five minutes. However, he contrived a timing device and cut the milking period for each cow by one-half minute. The entire herd is milked in four minutes for each cow. Results: this dairyman has saved sufficient time to haul an additional load of hay or do some other chore daily.

Some dairymen followed an unvarying routine or what Prof. Murphy described as a "milking pattern." That is, they would attach the milker, set the timing device, arrange the next cow for milking, check the machine, machine-strip if necessary, remove milker, pour milk into carrying pail, and attach milker to the next cow. Milk was taken to milkhouse when two pails had been filled. Two, instead of one, strainers were employed, thus cutting the time required for milk to strain.

Conveniently arranged stables were those having spacious alleys through the center. The manure spreader could thus be driven through. Stanchions were lined along both sides of this alley, cows facing away from the alley. Sixty per cent of the distance traveled in doing dairy chores are utilized behind the cows.

Hay and straw chutes are located at suitable intervals along the alleys of well-appointed stables. On one farm the silo chute was widened to accommodate a cart which could be pushed into it and loaded directly from the silo. Still another time and labor-saving method was the use of carts for feeding grain and silage, particularly with barns having cross alleys for feeding all of the cows without back-tracking.

Some of the stables were not sufficiently roomy to house calves, bull, and horses, as well as cows, these animals being housed in sheds somewhat removed from the dairy barn. This meant a multiplication of steps in going back and forth.

Milk production per-hour-of-labor on New York dairy farms has skyrocketed 49% in 30 years.

Yet this labor increase for dairying is not so glaring in contrast with some other farm operations. Potato and wheat production, for examples, have reached skyscraper proportions, more than 100% in per-hour-of-labor in the same length of time.

Straw Can Kill Legumes

That red clover and alfalfa seed you planted with your small grains last spring was expensive. How much of a stand you'll have *next* spring may depend on what you do with the combined straw this summer.

Agronomists at Ohio State University say: remove it as soon as you finish combining. Better yet, set the mower the same as you would for mowing hay—then mow the stubble, and rake off both straw and clippings at the same time.

"Wait a minute," you say. "I always figured that straw made a good mulch and built up the soil."

You're right—it does. But straw also smothers out legumes. That being the case, it's better to take it off.

Besides, a dandy stand of red clover or alfalfa will do a whale of a lot more for your soil than one crop of straw.

Taking off the straw has given better stands every single year for 11 years straight at Ohio. And where fields were mowed, besides, the stands the following year were even better. They produced half again more hay than fields where the straw was left on.

Dr. C. J. Willard has noticed that straw-covered plants seem to get along fine for a month or six weeks after combining, only to conk out some time between September and March. This has led the Ohio folks to believe straw damage to be more than just a case of shading. They think straw favors development of certain plant diseases.

Straw doesn't seem to be quite as hard on *sweet clover* as it is on red clover or alfalfa. The Ohio Station has found, however, that it pays to combine the grain high, and rake off the straw as soon as possible. Sweet clover, unlike red clover and alfalfa, should not be mowed during its first year.

—*Farm Journal*

Place of Forage Harvester on the Small Farm

Condensed from Agricultural Situation

Walter Wilcox,
Wis. Agri. Expt. Sta.
Emil Rauchenstein,
Bureau of Agri. Economics

THE field forage harvester is among the new machines that have proved useful on many farms in recent years. If you are among the farmers who are thinking about buying one, a study made in Wisconsin may help you decide whether or not it would be a profitable investment.

In the study, the problem of fitting modern labor saving machinery to the family sized dairy farm in Wisconsin was investigated by the Wisconsin Agricultural Experiment Station and BAE. Detailed information was obtained from more than 100 farms of 110 to 150 acres in size with 60 to 80 acres in crops. These farms usually are operated by one man with some help from his family.

The field forage harvester was found to have several advantages over conventional methods of harvesting hay, grass silage and corn silage. It saves considerable labor, permits more timely haying operations during unfavorable weather and eases the work, particularly in making grass silage.

On the other hand, the field forage harvester is too expensive for the hay and silage requirements of one family dairy farm. A small harvester with hay and corn cutting attachments and a blower costs about $1,700 this year. In addition, a mechanical unloading wagon with unloading drive and power unit is needed to reduce as much as possible the labor in handling the chopped forage. This costs about $900 on today's market, boosting the total initial investment to $2,600. The investment in conventional machinery—hay loader, corn binder, silage cutter and wagon—runs about $1,625. Upkeep costs for the field forage harvester also are apt to run higher.

Although the harvester is too costly for one family dairy farm, the study indicates that it is a more economical buy than the conventional machinery if purchased jointly by two or three farmers; or if one farmer buys the machine and harvests his neighbors' grass silage, hay and corn

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silage on a custom fee or exchange basis.

Here is the initial investment for the small field forage harvester jointly owned by two or three farmers:

Harvester with hay and corn-cutting attachments and blower:	
(1/2 interest)	$ 850
(1/3 interest)	567
Mechanical unloading wagon	750
Unloading drive and power unit:	
(1/2 interest)	75
(1/3 interest)	50
Total investment	$1,367 to $1,675

The investment for conventional machinery at today's prices:

Hay loader	$ 260
Corn binder	425
Silage cutter (1/3 interest)	180
Wagon	400
Total investment	$1,265

Farmers who have the time and are handy with tools can build a mechanical unloading wagon for much less than the cost of a new one. This would reduce the investment in a partly owned field forage harvester below that of conventional machinery. Plans for building such a wagon can be obtained from the Agricultural Engineering Department, University of Wisconsin, Madison.

The labor saved by the field forage harvester is its chief advantage over the usual machinery. When used to make grass silage or dry chopped hay equivalent to 40 to 60 tons of dry hay, it saves 48 minutes to 1 hour per ton or 32 to 60 hours. In making corn silage, the harvester saves about 6 man-hours per acre and makes the work of filling the silo easier. Since 8 to 10 acres of corn are usually put into the silo on the Wisconsin family dairy farm, this saves 48 to 60 man-hours.

The harvester also can be used to pick up straw in grain fields which have been combined. The saving in time over the hay loader is about half an hour per acre. On a dairy farm with 20 to 30 acres of small grain, this amounts to 10 to 15 hours of labor.

Total saving of labor in harvesting hay, making silage and picking up straw on the Wisconsin family dairy farm with 60 to 80 acres in crops would be 90 to 135 man-hours a year.

Another advantage of the field forage harvester is that it makes the work of making grass silage much easier than with conventional equipment. To the extent that the harvester encourages the making of grass silage, it results in important savings in nutrients. For example, harvesting the first cutting of alfalfa or clover as grass silage rather than hay will save 10 percent or more nutrients than if the hay were cured under usual weather conditions. Savings

may run as high as 30 to 40 percent in unfavorable weather.

Hay harvested with the field forage harvester is equal to long hay in feeding value. The chopping itself has no beneficial effect on palatableness and digestibility. However, the harvester may permit more timely operations in unfavorable weather. At such times, it would yield a higher quality hay than would conventional methods of harvesting. To get best results with the field forage harvester, the hay should be cut in relatively long lengths after it is properly cured in the field.

The farmer who is thinking about buying a field forage harvester should balance the savings in labor, the greater ease of making grass silage and the possibility of improved quality against the higher investment and upkeep costs. An important consideration is the condition of the equipment he has now and the price he could get if he sold it. Another important thing to think about will be the value of the labor saved. Unless he is able to use it profitably, the added cost would be the cost of more leisure time.

New Method of Raising Broilers

Condensed from American Poultry Journal

Roy E. Walsh

INTEREST is high these days among commercial poultry growers on the Del-Mar-Va Peninsula over a completely new method of broiler raising.

The method involves the use of a steam system which is converted into hot air for supplying warmth to the flock. This new system is in use by William Lane and Howe Lagarde on one of their poultry farms in Talbot County, Md.

In each broiler house, there is a single central heating unit, complete with a boiler and automatic stoker. The broiler houses are each divided in half, with the boiler room and truck-high feeding platform in the center. Running each way from the boiler room are 2 sections of steam pipe that run into heat exchangers. There, in the exchanger, the hot steam is converted into warm air which is blown by blowers

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through a hot air duct down into a series of 8 inch stove pipes.

The mouths of these pipes are about 15 ft. apart, 18 inches above the floor, and the hot air is directed from them down onto the flock. The air ducts are graduated in size to insure uniformity and control the velocity of air that will go through the pipes. In each heat exchanger there is a regular thermostat to insure constant temperature control. The blowers, which are part of the exchangers, have facing them outside outlets. With these, air from outside the building may be sucked in with complete control on mixture.

During the summer, the blowers can suck outside air through the vents into the house, and with the circulating air, considerably reduce the inside temperature. For control of humidity, steam may be exhausted manually into the air. This will be done by hose nozzles with needle valves. For reduction of extreme summer temperatures, packed ice may be placed in front of the air vents. The blowers will thus suck in ice cold air to be distributed evenly all over the house by the air ducts. In 1948, on the Del-Mar-Va peninsula, hundreds of thousands of broilers and fryers perished within a matter of a few days due to an extreme heat wave. With this system of cool air being distributed within the houses, the danger of the flock perishing due to high temperatures is practically eliminated.

The houses are 312 ft. by 48 ft. and hold in each 21,000 chickens. They were constructed in a manner that insures economy of operation and space. A truck can easily haul manure out or litter in. Feed rooms are truck-high, insuring easy unloading of the bagged feed. Loading the feed for distribution is facilitated because the track carrier is level with the feed platform.

The houses are insulated with double walls and windows, and the roof is insulated with commercial insulating material. Each window is double lined with aluminum roofing. Floors are dirt for economy's sake. To carry off ammonia fumes and other bad air, revolving ventilators have been constructed in the roof.

The primary purpose of the system is to cut costs. Rice coal, which is used in the automatic stokers, is not quite half the price of nut coal used in the usual type of coal brooder. The old type of stove usually burns ¾ to 1 ton per stove in a winter flock. If the old type of brooder stove were used in the new buildings, approximately 45 tons of coal and 45 fires would be needed. If with the new system, as much coal is used with only 2 fires, the part-

ners will still be ahead, as their labor will be greatly reduced. They figure that less coal will be used in the new system, and if this turns out to be true, additional savings will be made. Added to the saving in time and labor is that of space, as there is no need for hovers. Another merit of the blower system is that it may help control respiratory diseases.

The idea of hot air has been put to use by the Univ. of Delaware on a pilot plant basis, and excellent results were obtained with it. However, the project of Messrs. Lane and Lagarde is the first large scale commercial one. Poultry growers all over the country will watch with interest what might be a completely revolutionary method of raising broilers and fryers.

Subterranean Clover

Condensed from the Seed World

Howard Snyder

HAILED as one of the most recent outstanding finds in the forage world, Subterranean Clover, commonly called Subclover, is really not a new species at all. For centuries, it has grown as a roadside weed in the Mediterranean regions of Europe, and in Asia and Africa. Its value as a forage plant was first discovered in Australia, and it was from Australia that it was brought to the United States in 1922.

However, as a seed crop in this country, Subclover is most certainly new. The first harvest of commercial seed was made in 1941. Since that date, this clover variety has enjoyed ever-increasing success and popularity and the acreage has increased rapidly.

Subterranean clover is valued for its use as a forage crop. The forage is relished by all kinds of livestock, and it analyzes high in protein and minerals. In pastures, Subclover should be mixed with other grasses, such as Alta Fescue, for most satisfactory management.

An almost universally adaptable winter-annual legume, subterranean Clover gets its name from its habit of burying the growing seed-heads in the soil.

Subclover dies out completely in mid-summer, and comes up as

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a new plant from seed each fall and winter. If the soil is loose and it is not a drought year the seed heads may push down beneath the surface of the soil as much as an inch. Because a part of the seed heads are pushed down beneath the surface of the soil, Subterranean Clover will stand close grazing.

Like White Clover, Subterranean Clover has prostrate, creeping stems. Three leaflets form each leaf and are carried on an upright stalk.

The leaflet is broadest at the apex, usually is flecked with black, is frequently hairy, and often bears a white crescent-shaped marking.

The flower heads usually bear three small white to pinkish-white flowers in a cluster at the tip of a stalk arising from the leaf axel. After pollination, the flower stalk turns downward. A single seed develops from each flower.

The mature seed is a dark purple, is about as large as a Crimson Clover seed, and is enclosed in a brown hull.

Not all the seed push into the soil. About as many remain above as push into the soil in ordinary years. Both the seed above and below the surface of the soil will germinate in fall and winter to produce the new crop. Some seed are hard and do not germinate until the second fall and winter.

Because Subterranean Clover forms such a heavy matted growth on the ground, it virtually controls the weed situation once it is established.

The same reason that makes it a good weed killer also makes it hard to harvest for hay. By the use of a specially-devised lifter guard attached to the mowing machine bar, the matted growth of Subterranean Clover can be lifted up a little way from the ground and mowed to some advantage. A five-foot cutter bar is better than longer bars.

When mowing, this bar should be tilted forward and the tractor run in low gear in order to give the mower knife plenty of speed. This will help prevent pulling the vines loose and also prevent too much clogging. The mower should be equipped with a lespedeza cutter bar and windrower. This bar cuts closer to the surface than the standard bar.

The above method gathers from 200 to 300 pounds of seed per acre. About the same amount of seed is left on the ground, this being gathered up by specially built suction equipment after the hay is removed.

Another method that requires no special equipment is that of mowing the hay high, that is, above the seed heads with a standard mower and windrower. The field is then raked with a strong hay rake and the hay that is either cut or pulled up, left in windrows.

When this method is used the clover should be completely mature and dry so the plants will break off easily at the surface of the ground.

The seedbed should be fallowed during the summer months. Land should be broken in late spring, harrowed and cultivated frequently during the summer, but not re-broken in the fall.

Objectionable weeds such as wild morning glory, thistle, cypress weeds, hairy vetch, dog fennel, cockle, etc., are thus kept down. The seedbed must be firm and level. On the Oklahoma Experimental Farm at Stillwater, the seedbed is rolled with a cultipacker before seeding and after seeding.

Subclover thrives best on well-drained soils. It is not tolerant of poor drainage. For this very reason, it is excellent for seeding hilly pastures, many of which it has restored to flourishing greenery.

Sour, acid, exhausted soils low in organic mattter are not hopeless. Australian Subterranean Clover will grow on them where other legumes fail. One of the chief virtues of Subterranean Clover is its ability to resist acidity in the soil to a greater extent than any of the many other clovers.

With a firm, well-prepared seedbed that has been carefully fallowed during the summer months, the grower sows from 8 to 10 pounds of seed to the acre when a seed crop is to be harvested. If seed is plentiful and the soil is sufficiently strong he can sow as much as 15 pounds to the acre. The seed must not be covered to a greater depth than half an inch. Shallow planting is of great importance.

Seed may be either broadcast or drilled. More uniform stands are obtained by drilling. If the field is to remain in seed production more than one year, it will need to be reworked each late summer and early fall in preparation for the next year's seed crop.

Seed or soil should always be inoculated. Subterranean Clover develops root nodules with the same bacteria that inoculates white, red, crimson, and alsike clovers. However, there are cultures made especially for this clover which may be had at a very small cost.

On fields where the above-mentioned clovers are grown successfully and show healthy nodulation, Subterranean Clover will usually develop nodules.

There are some forty different varieties of Subterranean Clover grown in Australia. A number of these varieties are not suited to either the Pacific Coast regions or the South. Thus far, both in the West and in the South, Tallarook and Mt. Barker have given best

results. Mt. Barker is a variety that matures in mid-season and Tallarook is a variety that is medium late. Varieties that mature early are used in regions where rainfall is low and where late-maturing varieties cannot persist because of lack of moisture.

Farm Accidents

There are 19,000 accidental deaths on farms every year.

This totals up to an economic loss of one billion dollars annually.

Enough time is lost to the farmer through accidents to produce more than half the average annual wheat crop in the United States.

More than one-third of farm accidents occur in homes, with falls, burns, poisons, suffocation and firearms as the principal causes.

Farm work deaths are placed at 4,300 a year, motor vehicles accounting for about 1,000 of these fatal accidents.

In addition, there are 1,500,000 non-fatal farm accidents every year, with many of them causing permanent crippling.

"Agriculture is far behind most of the other groups in safety endeavors," declared the farm division of the National Safety Council.

Only recently has a beginning been made to reduce farm accidents.

Being alert to farm hazards will ultimately produce a safety consciousness on the part of farm people.

A farm safety program means the changing of some of the basic habits of 27,000,000 people.

Their habits of work, play, driving and living must be altered to reduce the cause of accidents.

There is an explanation for this large number of farm accidents.

Much of the farmer's work is done early in the morning or late at night when it is dark.

There are animals to be considered and carelessness with them often results in tragedy.

Farmers try to do their own repair work on buildings, and falls are frequent.

—*Medical Society*
State of Pennsylvania

Wheat—50 bushels per Acre

Condensed from Commercial Fertilizer

Walter S. Colvin

"FIFTY bushel wheat will soon be a reality on many Southwestern Indiana and Southeastern Illinois wheat farms", says Prof. Howard Lathrope, Purdue University Extension Agronomist who is also Director of the Southwest Indiana Wheat Improvement Association.

In the words of Prof. Lathrope, "The new, short, stiff-strawed, disease-resistant wheats plus plenty of complete fertilizer at seeding time, followed by an early spring topdressing with nitrogen, will mean greater farm profits and better living on the farm".

History is being made in the soft red winter wheat producing sections of Southwest Indiana and Southeast Illinois. Here, the country's most ambitious wheat improvement program is on the move. Over 2,000 farms are involved, which produce over 5,000,000 bushels of fine wheat for pastry flour.

Not satisfied with a mere 14 bushel wheat average, Soil and Plant Scientists decided to do something about the situation some nine years ago. Accordingly, Plant Breeders, Plant Pathologists, Botanists, Agronomists, Flour Mill Experts, Seedsmen, Farmers, Extension Workers and others joined forces, coordinated their efforts and developed a sure-fire program of wheat improvement. The results of their combined efforts have been remarkable—a tribute to the Southwest Indiana Wheat Improvement Association.

A major achievement of the program has been the introduction of new "college-bred varieties of wheat which far out-perform the old standard varieties. Such wheats as Rudy, Fultz, and Goens, standard for over 50 years, are fast becoming as obsolete as a team of horses on the modern farm. Currently the magic name in wheat for that area is Vigo. In practically all county wheat championship contests, Vigo has outyielded everything.

One of the greatest characteristics of the newer wheats is their ability to respond to heavy fertilization. In other words, "They can take it," says Prof. Lathrope, and, "This works to the distinct advantage of everyone, particu-

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larly the grower and miller by providing more wheat with better milling qualities." By way of comparison, a series of fertility experiments were conducted during 1948, comparing the older varieties with some of the newer selections. Without fertilizer, the old standards, Rudy, Fultz, and Goens each yielded about 16 bushels per acre.

With 400 lbs. of 3–12–12 at seeding time plus a 20-lb. spring application of nitrogen, Goens yielded 19 bushels, Fultz 21 bushels, and Rudy 27 bushels, all relatively small increases considering the amount of fertilizer applied. On the other hand, Vigo, a recently released wheat, averaged 24.5 bushels per acre without fertilizer but sky-rocketed to 45 bushels per acre when fertilized with 400 lbs. 3-12-12 at planting time plus an early spring application of 20 lbs. nitrogen. In the same experiment, a new strain "12457" produced 27.5 bushels without fertilizer and 46.5 bushels per acre with fertilizer. But Vigo isn't the stopping point. Dr. R. M. Caldwell and Prof. L. E. Compton of the Purdue Department of Botany and Plant Pathology and U.S.D.A., are developing a new series of short, very early maturing, stiff-strawed wheats. Prof. Lathrope states, "These new 'shorties' have captured the canny eye of every wheat grower who has seen them growing in test plots. They are resistant to leaf rust, mosaic, and loose smut. And how they yield when adequately fertilized. Results of 1948 tests show that all fertilized plots of the new short wheats yielded over 50 bushels per acre! This was about 20 bushels more than the old standard varieties were able to do. The new 'shorties' measure only 40″ in height when heavily fertilized, 8″–10″ less than commonly grown varieties." Prof. Lathrope says, "These short early wheats, during three years of testing, have shown remarkable adaptation in southwestern Indiana. They require further testing for both performance and grain quality. If they continue to live up to their record so far, it is hoped that farmers of that area will be able to obtain higher yields and to use more fertilizer on wheat with better returns on their investment."

Roughage for Dairy Cows

Condensed from Pennsylvania Farmer

C. B. Knodt

THE cheapest source of nutrients for dairy cows is good quality home-grown roughage. Research work as well as the experience of dairymen has shown that the most economical production is obtained when about 70 per cent of the nutrients are fed as good quality roughage. Fairly good production has been obtained with only large amounts of exceptionally high quality roughage. The degree to which grain can be replaced by roughage depends of course on the quality and kind of roughages fed. It should also be determined by the relative prices of grain, roughage and milk.

Recent work by the Bureau of Dairy Industry, Department of Agriculture, has demonstrated the possibilities of feeding cows only excellent quality roughage alone as compared to supplementing the ration with grain. It must be emphasized that this work was done with roughages of the best quality and with good cows.

One of the important factors in determining the feeding value of crops cut for hay is the stage of maturity of the grasses and

Type of Ration	Production		Relative Production	
	Milk (pounds)	Butterfat (pounds)	Milk (pounds)	Butterfat (pounds)
Alfalfa hay, corn silage, pasture and grain (1 pound to every 4.3 pounds of milk produced daily)	12,886	434	100	100
Alfalfa hay, pasture, and ground barley (1 pound to every 4.3 pounds of milk produced daily)	11,086	348	86	80
Alfalfa hay, corn silage and pasture	9,481	303	74	70
Alfalfa hay and pasture ...	8,938	285	69	66

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legumes when harvested. The crop should be cut when the roughage will be most palatable and the maximum nutrients are obtained per acre. The largest production of digestible nutrients is obtained when most plants are in the one-tenth to full bloom stage, depending on the mixture being harvested. Cows may refuse to eat a large part of the hay which is too mature. In addition, in plants such as alfalfa, every effort should be made to prevent the loss of leaves since this part of the plant contains about 70 per cent of the protein and 90 per cent of the carotene.

The method of harvesting may also determine to a large extent the quality of the roughage obtained.

Experimental work in this field indicates the value of silage and barn drying with heat in the preservation of grasses and legumes. One of our most important research problems is to work out acceptable methods of using heat in mow driers. These data also show the additional losses in feeding value with field curing as compared to mow finishing, particularly when hay is rained upon. Actually the loss of an entire crop of hay is not unusual due to rain. This, of course, can be extremely serious since it means the loss of the most important and economical feed that a dairyman has for his cows. Other work has indicated that 9 per cent more milk was produced from the same acreage of hay prepared by mow curing as compared to hay from a similar acreage which was field cured. In other trials the feeding value of alfalfa has been shown to be equal when preserved as wilted silage or as field cured hay. This is only true when the hay is of the very best quality. The silage will produce more milk when the hay is of fair or poor quality. A number of other experiments using clover, alfalfa and various grasses have indicated the greater feeding value of silage. Cows have been fed as much as 123 pounds of grass silage per day for a long period of time without any ill effects.

Various experiments have also demonstrated that cows on pasture or on grass silage feeding should be fed small amounts of hay. The hay apparently increases the digestibility of the silages or pasture. Several pounds of fair quality hay per day will increase the milk production of cows as well as increase the gains made by heifers on pasture. Results to date indicate that grass silage can be used to replace corn silage in the rations of dairy cows. If the grass silage contains legumes, the protein content of the grain fed may be reduced because of the higher protein content of the grass silage as compared to corn silage.

The protein content of the grain mixture should vary with the type

and quality of roughage. A lower protein ration can be fed with legume roughages than with those made up largely of grasses. This is important since dairymen tend to overfeed on protein and underfeed on total digestible nutrients. In work at the Beltsville Experiment Station cows produced just as well on a grain mixture containing 11 per cent protein as they did on one with 18 per cent protein when receiving 10 to 12 pounds of No. 1 timothy, 3 to 4 pounds of alfalfa, and 15 pounds of corn silage per 1,000 pounds of body weight. If corn silage is fed with fair quality grass hays, 16 per cent grain rations will satisfy the needs of dairy cows. Eighteen per cent grain rations may be needed where roughages of very poor quality are being fed. When cows are fed roughages of good quality grass hays cut in early maturity, grain mixtures containing only 12 to 14 per cent protein have been used satisfactorily. Grain rations containing 10 to 12 per cent protein may be fed successfully when large amounts of exceptionally good legume hays and silage are fed.

The importance of the feeding of good quality roughage to dairy cows in the form of hay, silage and pasture cannot be over-emphasized. Dairymen should take every possible advantage of the maximum use of roughages in their programs so as to produce the greatest amount of milk as economically as possible.

Method of harvesting	% Dry Matter Preserved	% Protein Preserved
Crop as cut	100	100
Silage	84	84
Barn finished hay—heat	87	78
Barn finished hay—no heat	81	76
Field cured hay—rain	60	49
Field cured hay—no rain	75	69

How Sure is Your Fire Insurance?

Condensed from N. J. Farm and Garden

E. M. Whitaker
Federal Land Bank of Springfield

INDIFFERENCE is a high price to pay for the failure of insurance, and yet the average person pays little or no attention to the technicalities of his insurance policies. Admittedly, there is a detail of legal phraseology in a policy, especially in the fine print, called stipulations, that impresses one with the futility of trying to understand it, but not to do so may mean serious financial loss.

How long does it take an average farmer to own his own farm, free and clear? Approximately a lifetime for many farmers. How long will it take fire to burn his buildings? Approximately 45 minutes! What is the possibility of the average farmer having a fire loss? General fires of all kinds throughout the United States total staggering sums. The 1947 figures of over $700 million show this United States of ours is burning at the fastest rate ever recorded in our history. In the past five years, one farm family in 10 suffered a fire loss. Farm losses average approximately $100 million a year. Nearly 3,500 farm folks die in these fires.

Most of us cannot afford to gamble with our future, but to the extent one does not purchase protection to the limit of his actual needs he is gambling with fate. There is more under-insurance today due to the mistaken idea of saving pennies than ever before—whereas the savings come through appropriate protection.

If the average farmer carries insurance today in the same amount as carried in 1941, he is approximately 40% short of the amount needed for replacement, under existing costs of labor and materials. He is about 30% short if his schedule of insurance has not been increased since 1942, and perhaps 8% short in comparison with 1945. There are unfortunately many instances where farmers carry today the same insurance they carried 10 years ago and do not realize the extreme hazards they face, should fire occur.

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Sea Isle City, N. J., July, 1949

Cost of insurance is dependent on the form used—and the form is decided by the agent after consultation with his client, the determining factor being the commercial or non-commercial use of the land. While the farmer is largely confined to the Farm Form, which carries the highest rate, many are entitled to reduced ratings for credits such as standard chimneys and roofs, lightning rods, no hay, etc., in outbuildings, and the use of the "Three-Fourths Value Clause." Rate reduction is also allowed if the farm is in a town with an approved fire department and available hydrants.

Much farm fire insurance is written under the "Three-Fourths Value Clause" which reduces costs—but its use should be clearly understood by the farmer. Under such clause never insure a building for an amount in excess of three-fourths of its value, since the company will not pay beyond that amount. If the value of the poultry house is $4,000, you would not insure beyond $3,000 under this clause. If you want protection of $3,500, you would not use this form, and the rate would be higher.

If your dwelling becomes vacant or unoccupied beyond 60 days in some states, notify your agent and obtain a "Vacancy Permit" to attach to your policy, since otherwise coverage may be suspended thereafter if such condition continues.

The "Livestock Pro Rata Clause" is often misunderstood. To secure total reimbursement for loss of cattle, you should carry 100% of value. If your herd of 50 cows is valued at $15,000 ($300 each) and is insured for only $7,500, you are insuring only one-half the value of each head.

Should one cow be destroyed in a fire, you would collect only $150. Use of "The Limit of Liability" item produces full settlement under a partial loss, but it costs more. The principle of "Pro Rata Distribution" applies in many policies to insurance on tools, machinery, and equipment.

It's a wise farmer who keeps an inventory of his personal property, showing date of purchase and cost, deposited in some safe outside place, in order to substantiate a loss claim.

Incomplete title in a policy may reduce a settlement. It is of great importance to realize that the purpose of the fire insurance policy is to protect the interest of the party or parties listed therein and no one else. If you are the sole and unconditional owner of the property being insured, then only your name need appear on your policy, but if, according to the deed, title is vested in yourself and your wife or yourself and your brother,

etc., then it is necessary that both names appear in the policy to provide full protection.

Don't thoughtlessly tell your agent you own your farm if actually it is jointly owned with another. If a barn, valued at $10,000 and jointly owned by John Smith and his brother, Charles, is insured for $10,000 in the name of John Smith only, then only John's interest (50%) is insured and in case of loss, the companies' liability is only to the extent of John's interest which would be $5,000 regardless of the fact that the total insurance was $10,000. Check your policies to make sure each one recites full and complete ownership in its title.

A windstorm may destroy an important building just as completely as a fire, leaving a farmer with the problem of replacement without funds for that purpose. Losses caused by such storms are becoming common. An explosion likewise can demolish a building. Buildings can be damaged by hail, riot, civil commotion, aircraft, smoke, and vehicles.

The ordinary fire insurance policy makes no provision for recoveries under losses of these kinds. However, the insurance trade has developed the "Extended Coverage Endorsement" which may be attached to most farm fire insurance policies and thus afford protection against these hazards and to the same extent as does the coverage against loss by fire. Costs are moderate.

If you have more than one policy insuring the same buildings, remember that if the "Extended Coverage Endorsement" is attached to one, it must be attached to the others to insure total recovery under losses of this kind.

National statistics indicate a larger number of accidents on farms than in most other occupations. It seems wise, therefore, for many farmers to carry "Workmen's Compensation" in order to meet expenses arising out of injuries to employees. There are some very good comprehensive personal liability policies which relieve the farm owner of losses or financial burdens imposed on him through suits, due to accident or injury on the farm. Consideration should be given to required insurance on motor vehicles used by the farmer. Bodily injury and property damage claims, due to automotive accidents, run high and if your trucks are frequently on the highways, consider well your position if an accident claim is enforced against you. Never propel a trailer over the highways, attached to your passenger car, unless your policy is endorsed with such permission.

Insurance is of such a growing vital necessity that today it

becomes necessary for every farmer to acquaint himself with these various types of protection which he may need to avoid serious losses. Farmers must today give greater thought to requirements of policies imposed on them in order to maintain full, collectible coverages.

The American Agency System is the right arm of the Stock Insurance Companies. Not only are the agents the ambassadors of the companies, but to a large degree they are the only link which connects most policyholders with their companies.

A good agent, who thoroughly knows his business and takes a personal interest in his assureds, is a contact of value beyond estimation and his assistance is well worth cultivation on the part of every farm owner. Periodic discussion of insurance in general, and your own schedule in particular, pays dividends. While the average agent has every intention of writing protective insurance, yet in too many instances he is not informed of circumstances which affect the legality of insurance. So be sure your agent gets all the details to make your insurance sure.

Feed Lambs Silage; Saves Land and Water

Here's a way lamb feeders can save land—water, too—if you're in an irrigation district: substitute corn silage for some of the alfalfa in the ration.

It's being done by P. E. Neale, sheepman with the New Mexico Station. He feeds lambs up to 3 pounds of silage a day without reducing their gains.

This is the way he figures the saving in land and water: an acre of irrigated alfalfa takes 4 acre-feet of water. At the rate of a 5-ton yield of hay, it would take about 2½ acres of land and 10½ acre-feet of water to grow enough alfalfa to feed 100 lambs.

Yet farmers get 20 tons of silage from an acre of corn with only 2 acre-feet of irrigation water. If you do that, and feed the lambs 2¾ pounds of silage a head per day, you'll need only 1¾ acres of land and less than 6 acre-feet of water to grow the roughage for 100 lambs. (This is a saving of ¾ acre of land, and more than 4½ acre-feet of water.)

You can keep up the soil fertility, too. Put phosphate on the alfalfa, and use the manure from the feed lots on the corn land.

—Farm Journal

Difficult Breeding

Condensed from Guernsey Breeders Journal

Dr. E. J. Perry
Rutgers University, New Jersey

HARD breeding and sterility continue to plague most herds periodically, and some herds regularly. Particularly concerned is the breeder of registered stock, because his calves are his hope for improved herd production and for animals to be offered to the public. One of the biggest headaches of producers and milk dealers is irregular seasonal production. A major cause of this, in turn, is the difficult breeding cow. Under natural breeding conditions, her breeding efficiency is usually highest in spring and summer for most parts of the country and Canada, from which special studies have been reported. Data from artificial breeding associations in some northeastern states tend to show the efficiency for the particular years covered, to be a little the highest in October and November, and the lowest in April and May. There are many hard breeders and sterile females in all seasons.

The problem is a complex one. We are safe in assuming that all factors which have a bearing on reproduction are not yet known. The breeder who seems to be meeting with the most success in attacking it is the careful manager who understands the functioning of the reproductive organs of cattle. Almost invariably, the herds with highest breeding efficiency are those on which breeding records are regularly and painstakingly kept, that are fed in keeping with the latest and best that science can offer, and that have the benefit of timely veterinary assistance. It has been well said, by Dr. S. A. Asdell of Cornell University, that sterility is not a disease in the ordinary sense. He reports, "It is a symptom—one which accompanies many diseases just as fever is a symptom that is found in a variety of diseases. Fever can be reduced by taking proper measures, but it cannot be eliminated unless the cause is found and cured."

It is not surprising that many breeders are inclined to become a bit panicky and resort to odd measures when some of their cows show breeding trouble. Many owners give up hope rather quickly, but it is a good time for

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Peterborough, N. H., February 1, 1949

one to "keep his head." Many good cows that have been sold when they failed to conceive after three services at regular periods, would have done so on a later service. A classic experiment to prove this was conducted by Dr. Asdell a few years ago. A considerable number of apparently infertile Bang's disease-free cows were divided into two groups. The cows in the first group were injected periodically with certain hormones for six months. Those cows in the second group received no treatment. The cows in both groups were bred regularly to the same fertile bull when they came in heat. In less than a year approximately 50 per cent of the cows in each group became pregnant. Had there been no control group, it would have been easy to believe that the hormones had effectively cured half of those treated. Apparently there is good evidence that certain hormones have produced positive results in various cases of breeding trouble. Experiments by Turner of the Missouri Experiment Station and Reineke of the Michigan Station, showed benefits from feeding thyroprotein, especially in areas of iodine deficiency.

The part that nature can play cannot be overlooked. It is likely that some of the cows in the Cornell experiment had to build up certain reserves before they could conceive. In work with bulls, a Belgian committee for the control of sterility reports, "true absence of sex drive seemed to occur as a result of under feeding, or after a considerable period of too frequent service. Rapid improvement was effected best by sexual rest and by giving of protein-rich feeds. Thyroxine and sex hormones seemed helpful, too, in the treatment to increase sexual desire."

Much wishful thinking has existed regarding the use of certain advertised remedies. Too many recoveries have been attributed to some treatments. Insufficient research, both in amount and quality, is sometimes conducted before the advertising of the product begins. No fair-minded manufacturer wants to "cash in" on natural recoveries.

Recent New York experiments with wheat germ oil failed to show that feeding it to bulls of low fertility was of benefit. This oil is rich in vitamin E and was added to the ordinary ration. At the Minnesota Experiment Station, normal reproduction occurred when cows and bulls were fed vitamin E—free rations, although after that ration was fed for a few consecutive years, some of the animals suffered from heart trouble. In Iowa trials, supplementary vitamin E did not improve fertility in goats and ewes. In 1945, a special committee of the National Research Council reported

on Recommended Nutrient Allowances for Dairy Cattle. It said, "claims that vitamin E therapy gives beneficial results in reproduction in cattle have not been substantiated."

There is some evidence that shy breeding, as it is generally thought of, may be inherited to some extent. It has been well established that the kind which is due to structural defects of the reproductive organs of the cow or bull is heritable. Such defects are frequently noted in inbred families. Most breeders of long experience can tell of certain cow families that possessed an almost faultless breeding history, while in the same herd there were other cows which seemed to be chronic trouble makers.

Some breeders incline to the belief that most hard breeding heifers are apt to be slow breeders throughout life. Happily, this is not the fact, as revealed through work done by Hayden in Ohio, and by Trimberger and Davis in Nebraska. Thus, it appears that it will usually pay to be a little patient with a slow breeding, well-bred heifer, and even call the veterinarian before selling her for beef and raising or buying another to replace her. From studies of breeding histories of 12,621 cows in the New York Artificial Breeders' Cooperative, Tanabe and Salisbury reported that the best conception rates occurred at the ages of three, four, five, six, and seven years.

Causes of variation in fertility among the cows in 38 herds in South Finland have been reported by Korkman of Sweden. These herds were free from tuberculosis and Bang's disease. Age became a significant factor as early as the fourth year of life. After multiple births, an average of 23.2 cows was discarded per 100 service periods, and after single births only an average of 7.3 was disposed of per 100 service periods. On those farms where a very large per cent of the nutrients came from hay, pasture, silage and green crops, the fewest cows were culled, because of sterility. Where the level of feeding was quite high, the per cent of infertile older cows was greater.

In a Danish experiment, giving bulls forced exercise just before semen collection resulted in more semen and sperm. Two groups of nine bulls each were worked with. They were stall tied and similarly fed and managed except that one group was exercised for 45 minutes daily just prior to being used. The average size of ejaculate of the exercised group was 8.3 cc of semen per bull, and for the control group it was 6.8 cc per bull. Prior to the trial, the average size of ejaculates per bull for the groups was 7.3 cc and 6.8 cc, respectively. Just what the results would have been if the bulls had

not been confined to the stalls most of the time, is a matter for speculation. The results do indicate that a reasonable amount of exercise does not harm a bull, and is probably beneficial in just about every case. Long outside runways are recommended.

In a study of artificial breeding records of 125,000 cows and 71 bulls in New York, Mercier and Salisbury found evidence of a relationship of fertility to length of day. They believe that light affected production of cattle in the latitude of the area by the action of light on the pituitary gland through the eye and its optic nerve. The younger and older cows were influenced more easily than the other ones. Cows from 39 to 63 months old showed best fertility in the spring and fall months, but the younger and older ones had more seasonal fluctuation. The fertility of the bulls also seemed to be influenced, but there was a lag of one or two months before the full effect of the daylight was manifested.

One of the most important studies in many years was recently begun by Dr. T. Y. Tanabe and L. E. Casida, of the University of Wisconsin. It has already thrown considerable light on the character or nature of breeding failures in sterile or slow breeding dairy cows. The report, as given at the annual meeting of the American Society of Animal Production, covered the results of work with 104 cows, of which 49 were Guernseys and 55 Holsteins. Each had failed to conceive when bred four to 13 times. All of these cows were killed, but at two different times. The per cent of genitally normal ones having fertilized ova when killed three days after they were last bred was 66.1—a surprisingly high figure. The others were killed 34 days after they were last bred, but the per cent with normal embryos was only 23.1. Genital abnormalities were found in 10.6 per cent of the cows at time of slaughter. They had not been detected by clinical examination. In 8.7 per cent of these, the abnormality was an obstacle to fertilization. The investigators divided up the 104 cows into three groups on the basis of reproductive performance during the first 34 days after they were bred the last time: 1, failure of fertilization, 39.7 per cent; 2, embryonic abnormalities and mortality before 34 days, 39.2 per cent, and 3, embryos still normal at 34 days, 21.1 per cent. It was estimated that the factors of breed, number of previous calvings, herd size, and herd breeding index, had considerable effect on the fertilization rate, and that the last mentioned three, and also Bang's disease, played a part in connection with the embryonic deaths.

Reports from various quarters denote a higher per cent of sterile

cows today than several decades ago. In some states, approximately 30 per cent of all cows that go to the butcher are sent on account of sterility. However, part of the explanation consists in the fact that as fewer cows go out due to Bang's disease and tuberculosis, a somewhat higher per cent can be expected to be sold on account of sterility. Sooner or later all cows become non-breeders as age advances, but there is no doubt as to the acuteness of the problem. Is increased production a factor in many herds? Is the depletion of the soil of certain essential mineral elements having a bearing on the problem in some areas? To what extent is the increased traffic in cattle affecting the fertility of many of our herds? Is too much close breeding lowering conception rate in various herds? These are just a few of the present day questions to which future investigations will probably furnish an answer.

The individual cow problem is more prevalent than the herd problem. Failure to call a veterinarian has sometimes turned a cow problem into a herd problem. When a number of the cows require repeat services, herd trouble is indicated which, for example, might be due to an infertile bull, or bad nutrition, or disease.

The control measures given for difficult breeding by Dr. J. F. Witter, Animal Pathologist, in Maine Extension Bulletin No. 335, are probably as good as any that can be recommended. In brief, they are:

1. Keep accurate breeding records, giving the heat, breeding and calving dates, and treatments or observations, if any, by the veterinarian. Proper records will help to determine accurately when cows are in heat.

2. Have a veterinarian make routine pregnancy examinations and at the same time examine and treat for breeding difficulties. Pregnancy is usually diagnosed most accurately after two to three months. Failure to come in heat can be corrected. Cystic ovaries, retained fetal membranes, and pus in the uterus can be treated with reasonable assurance of success. Hopelessly sterile cows should be culled.

3. Check the nutrition of the herd with your county agent or veterinarian, and supplement the rations with the necessary vitamins or minerals if there appears to be a deficiency.

4. Raise replacements and avoid the risk of buying problem cows which have been passed along from one herd to another. The best milk cows are rarely sold, but it is common practice to dispose of milk cows showing poor production, mastitis, or breeding difficulties.

5. Breed well-grown heifers at 14 to 16 months, depending on

the breed. This often increases their chances for conception and allows time in case several services are required. Breed problem cows as early as the second heat or within 40 days following calving.

Meat Animals in Our National Economy

Condensed from the Shorthorn World

R. C. Pollock

I RECOGNIZE as do you that the progress of our livestock industry is very definitely associated with this nation's forward progress, along both industrial and agricultural lines.

The people of this country represent, in numbers, only about six percent of the world's population. Yet in the year 1947 we produced in this country approximately 35½ percent of the world's meat—a total of 23 billion, 425 million pounds. That fact is well worth remembering as we consider the vastness of our resources—our capacity to move forward. I think that it is tremendously significant in terms of our productive efficiency, to remember that this meat supply was produced on America's farms and ranches by only about 18 percent of our total population.

As we think of animal agriculture or livestock farming, a panorama of scenes comes to mind. We think of the nation-wide nature of the business, for cattle, hogs and sheep are produced in every state. And last year these meat animals furnished a cash income totaling 9 billion, 300 million dollars.

We think of our millions of acres of grassland and range vegetation, comprising more than half of our total land area—and of little or no value except for livestock. We visualize an assembly line which includes some 5½ million farms and ranches where our meat animals are produced—the marketing agencies which facilitate the business of converting shipments of livestock into cash and thousands of meat packing plants which process our meat supply and make available a

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wholesome and healthful product.

We think also of our retail markets across the country which utilize modern cutting and packaging methods and set up attractive displays designed to create consumer appeal.

We recognize the fact that millions of persons are engaged in these vocations as well as in transportation and many other fields which make possible an unceasing flow of meat to America's tables. Indeed, this great industry affects, in one way or another, nearly every business in the nation.

On January 1, 1948 on our farms and ranches there were 78,564,000 cattle, of which 41,229,000 were classified as beef cattle. There were 55,038,000 hogs and 35,332,000 sheep and lambs.

Through the years our centers of meat animal population have moved westward. In 1850, New York led every state in cattle numbers. Texas now leads. In that same year Tennessee led in hog numbers, but since 1880 Iowa has held that record. In 1850, Ohio was first in numbers of sheep, but for many years, Texas has led in sheep population.

In 1947, the statistics showed that 63 percent of our meat was produced in the 22 states west of the Mississippi River and only 37 percent east of the river. Because of its greater population, however, from 65 to 70 percent of our meat supply is consumed in the east-of-the-river states.

Although livestock and meat are produced in every state, certain states stand out as of major importance. Last year the 12 leading beef and veal producing states provided us with 61 percent of our beef and veal supply. Our 12 leading sheep states were the source of 67 percent of our lamb and mutton. The twelve leading hog states produced 77 percent of our total pork.

From the standpoint of total meat production, the twelve leading states, which together occupy about one-third of our total land area, produced last year about two-thirds of all our meat. In order of their meat output these states were—Iowa, Illinois, Texas, Missouri, Minnesota, Nebraska, Indiana, Ohio, Kansas, Wisconsin, South Dakota and California. Ten of the twelve are in the Corn Belt, one is a Southern and one a Pacific Coast State.

As we view this nation's agriculture, it is of interest to note that 60 percent of the returns from farm marketings last year, came from livestock sales and 40 percent from the sales of crops. These figures emphasize the position of products of animal origin from the economic standpoint.

The importance of this business is recognized by the nation-wide attention being given to the solu-

tion of livestock problems. In the first place, there are problems which concern the animal husbandry workers, including the geneticist, the veterinarian, the animal nutritionist and many more.

Let me clinch that point by an illustration. The meeting of the American Society of Animal Production brings together animal husbandry workers from the agricultural experiment stations of this country and Canada. These men meet each year to discuss livestock problems.

At the opening of the meeting a very significant statement was made by Paul Gerlaugh of the Ohio Agricultural Experiment Station, and president of the Society. Mr. Gerlaugh said in part: "Regardless of whether you are interested in breeding as an art or a science, we are certainly all together in wanting to get a more efficient livestock machine to turn our grass and hay into meat and other livestock products."

What were some of the problems discussed at this meeting where more than 100 papers were presented? Well, they dealt with many phases of the livestock and meat industry. There were sessions devoted to animal breeding problems. Other sessions were concerned with nutrition problems—such problems as vitamin deficiencies in meat animals, the amino acid requirements of swine, the effects of certain preparations and certain feeds in promoting growth and in holding down death losses.

There were discussions relative to the control of brucellosis, the control of parasites, animal fertility, use of hormones, and use of pastures. A special session was devoted to the industry's finished product—meat, with special reports given over to meat storage, processing, factors which improve meat quality, meat cookery and other topics. Practically every subject considered on the two-day program was directly or indirectly related to efficiency of production.

Science has been brought to bear on our livestock problems. Much work has been done in the progeny testing of meat and dairy animals. In actual tests, for example, calves from one sire have required 500 pounds of digestible nutrients to produce 100 pounds of gains. Calves from other sires have required as much as a thousand pounds of such nutrients for the same gain.

Study is being given to the reasons why meat animals vary in their ability to make gains—why some are good doers and others are poor doers. We now know through extensive work carried on in this field that many impor-

tant characters can be perpetuated through breeding—such as efficiency of gains, tenderness of meat, proportion of fat to lean, and dressing percentage.

Tremendous progress has been made in the feeding of livestock. Some startling results have been achieved in this important field. At Purdue University in Indiana, for example, two lots of pigs were fed on the same rations, with one exception. Salt was added to the mineral mixture given to one of the lots. The lot not receiving salt gained about nine-tenths of a pound. The lot receiving salt gained 1.6 pounds per day per pig. And the lot receiving the small addition of salt to the ration made 100 pounds of gain with 200 pounds less feed.

Within recent years we have just discovered the value of pastures in keeping down cost of gain. Working with animal husbandry men are the plant breeders who are evolving new strains of grasses and improving long-known strains.

And while scientists are carrying on research projects which are designed to benefit animal agriculture and solve problems, the livestock farmer has his specific problems. One of these problems has to do with labor.

Production costs on farms and ranches have risen. Costs of farm machinery, fences, building material and other supplies have risen. Even though plant breeders have provided hybrid corn and improved varieties of cereal and forage crops which have boosted yields, the farmer knows that the added withdrawal of plant foods from his soil constitutes a problem which must be met. Livestock diseases and parasites continue to take their toll to a greater or less extent.

No country in the world can boast of better animal health than this country. In no other country have they made such progress in the control of animal plagues. Texas, or southern cattle fever, once a scourge of cattle herds in many states, virtually has been wiped out. The terrific losses formerly suffered by stockmen from bovine tuberculosis have been reduced to a minimum. Through the use of serums, vaccines and other preparations, diseases in our flocks and herds are being combatted pretty effectively. And with the veterinary profession and others waging war against brucellosis and against parasites, it is hoped that the fight against these will ultimately be won.

We are agreed that one of the major advantages of animal agriculture is the improvement of the soil.

We have been exploiting our soils at such an alarming rate that national interest has been aroused in soil fertility, soil build-

ing and soil conservation. Actual tests made in our leading crop producing areas have shown that soil fertility has been depleted, soil erosion has taken its toll and millions of tons of fertile soil have been carried to the sea which might have been retained had proper farming methods been practiced.

The old saying that "livestock farming is the only permanent form of agriculture," is still true. This fact becomes more significant as time goes on. We know that if we are to maintain and improve the fertility of our productive agricultural lands, we must utilize our forage crops and legume crops right on the farm. We must, as far as is possible, market the products of the farm in the form of livestock and livestock products.

A permanent agriculture demands that we must carry on carefully planned crop rotations, that manures and other crop residues must be returned to the land—thus adding to the plant food of the soil, increasing its water-holding capacity and improving its texture.

Within recent years there has arisen a specific soil problem which is arousing interest and concern among animal nutrition workers, human nutritionists and others. I refer to the fact that in many areas, there is now a deficiency of certain plant food elements, which were formerly given little consideration as one thought of soil fertility. These elements are known as trace elements. They include cobalt, zinc, boron, manganese, magnesium and others. A lack of such elements in the soils where crops are grown and fed to livestock, is held to be the cause of certain animal ailments.

An enlarged neck or goitre in calves, colts and lambs, and hairless pigs are conditions likely due to a lack of iodine in the ration. Thumps in pigs likely indicates a lack of iron and copper and probably cobalt in the ration. A lack of nerve control and convulsions in certain animals is apt to indicate a lack of magnesium. Lameness in pigs is likely to indicate too little manganese in the feeding rations.

Dr. Wm. A. Albrecht of the University of Missouri and a nationally known soil scientist points out that various human diseases which are on the increase may be due to the consumption of foods produced on soils deficient in various trace elements. He believes that the increase in heart disease, in arthritis, hay fever, cancer and others, as well as dental decay, are likely to be due to this factor. That view is now being shared more and more by medical doctors, and the subject of soil is now one which is being discussed at medical conventions.

Thus we have another problem which must be met. It will demand no doubt the combined efforts of soils experts, animal nutritionists and others.

If as a nation we should ever lose sight of the value of animal agriculture in our national economy, we need only visit countries where livestock and meat production is at a low ebb. Let's take, as an example, India and China. The consumption of meat in these countries is less than 20 pounds per capita. Compare that with our per capita consumption of 145 pounds this year.

In China and India, only 9 percent and 16 percent, respectively, of the protein in the diet of the average man is of animal origin, while in the United States the figure is 57 percent.

A study of the people of these countries and our own reveals some very interesting facts. The height of the average man in this country is 5 feet, 7½ inches. In China and India the average height is 3½ to 4½ inches less.

The weight of the average man in the United States is 154 pounds. In China it is 120 and in India only 110 pounds — 34 pounds and 44 pounds less respectively.

Of especial significance is a comparison of the life expectancies of the average man of each country—in this country 65 years—in China, 30 years and in India only 27 years.

It would thus appear that there is a definite relation between our diets, physical characteristics and life expectancies. The advantage is in favor of the diets which have the greatest proportion of animal foods.

In the story of animal agriculture and its progress through the years the importance of research cannot be over-estimated. Intensive studies have been carried on at some 22 colleges and universities in the past quarter of a century. As a result, much information has been secured relative to the nutritive value of meat—its place in the adequate diet.

It was research which revealed the value of liver in the prevention and treatment of pernicious anemia. It was research which has shown not only the high quality of meat protein, but also its superior qualities in blood regeneration and in building resistance to disease.

Research has shown the high value of meat in the diets of blood donors from the standpoint of blood regeneration. Within recent years the value of meat in the diets of infants as early as six weeks of age has been demonstrated—as well as the importance of meat in the diet of young children, for better growth, sturdier bones, greater resistance to infections and other values.

A meat research study at the

University of Wisconsin disproved the commonly held theory that meat was a rather poor source of vitamins. That study revealed that meat is one of the richest sources of the B vitamins.

Cooperative research carried on at colleges and universities across the country and by the United States Department of Agriculture has revealed a wealth of information concerning the factors which influence quality and palatability in meat. As a result of this work, we now have a better knowledge of the production, processing, and cookery methods which are related to providing the kind of meat which the public wants to buy. Thus meat research has played its part in the advancement of animal agriculture, and will continue to do so in the future.

Equipment for Weed Control Sprays

Condensed from American Agriculturist

Paul R. Hoff

A VARIETY of pressure spraying equipment can be used to apply weed-control chemicals such as 2,4-D to plants. Small spray guns, knapsack sprayers and power sprayers are commonly used. The selection of the type usually depends upon the equipment that is available and the crop or the area to be treated.

Regardless of the type of equipment that is used, there are several principles that apply to all chemical weed spraying. Best results are obtained with pressures of 30 to not over 100 pounds. Usually 30 to 50 pounds are sufficient. Higher pressures not only are wasteful but increase the possibility of wind drift, and of course wind drift can carry the weed-destroying chemical to sensitive plants that should not be killed. There is less danger of wind drift if the nozzles direct the spray downward and if the nozzles are not more than 24 inches above the ground.

Spraying equipment that can be mounted directly on tractors has been developed for field crops. The system consists of a small pump with a capacity of 3 to 5 gallons per minute at 30 to 50 pounds pressure, a barrel or a tank for holding the spray solu-

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tion at atmospheric pressure and a spray boom of any convenient length up to 30 feet. Small gear pumps are commonly used along with plunger or vane pumps of low capacity. The pumps can either be mounted to be driven from the power take-off or from the tractor belt wheel.

Experience has indicated that the boom works best if it is from 12 to 24 inches above the ground. For uniform spraying, the correct nozzles must be used. Low volume nozzles can be purchased from most dealers or manufacturers and tables giving the rate of discharge, pressures, angles of spray and recommended nozzle spacing are also available. The tables giving the information as a guide to the rate of spray application are important, because the application rate is important. Instructions for mixing the spray solution and the rate of application must be followed closely. An overdose may seriously injure crops and, if the solution is too weak or the application less than recommended, a poor weed kill may result.

In addition to the tank, pump and boom assembly, a pressure relief valve together with a pressure gauge and a quick acting relief valve, screens, pipe fittings and pipe are needed to complete the system. Line screens and nozzle screens help to reduce plugging of the nozzle openings. The pressure relief valve is necessary to enable the pump to maintain the correct pressure. If the pump is equipped with an automatic relief valve, it is not necessary to purchase an additional one. In addition to the relief valve, a pressure gauge is necessary; also a quick-acting gate valve to stop the spray quickly.

The familiar knapsack sprayer is useful for applying weed-control sprays to small areas such as lawns or gardens. The rate of application is more difficult to determine accurately or to maintain. If the rate of nozzle discharge is not known, it can be ascertained by learning the time required to fill a pint or a quart fruit jar. The rate of application can be determined by checking the area of ground covered in the same length of time. Small storage tanks with the spray solution under pressure can be mounted on power lawn mowers or garden tractor equipped with boom assemblies. This apparatus is suitable for large lawns, golf courses or other extensive grass areas.

Spray equipment for using 2,4-D dissolved in oil should have parts such as hose or gaskets made of neoprene, to avoid damaging this part of the equipment.

All equipment used for measuring and spraying 2,4-D must be thoroughly cleaned before being used for insecticides. Even a small residue in a sprayer may be enough to damage sensitive plants. It is practically impossible to remove 2,4-D from wooden tanks. The U. S. Department of Agri-

culture recommends a solution of household ammonia of 2 tablespoons per quart of water left in the spray tank, boom, hoses and pipes for a period of from 12 to 24 hours. The equipment must then be thoroughly rinsed with clean water. To be sure that all of the residue has been removed, a sensitive plant should be treated with water from the sprayer. If the plant is not affected in a day or two, it can be assumed that the equipment is safe for other use. Users of knapsack sprayers or other small equipment may find it more practical to have separate sprayers for 2,4-D rather than to run the risk of damage.

Another precaution is that the tank and spraying system must be free from sediment, and clean water must be used for the spray solution. The 2,4-D products must either be completely soluble or form an emulsion that leaves no residue to clog the nozzles while spraying. Also, the equipment must be carefully checked to make sure that the rate of discharge is the same as calculated. The spray discharge rate can be changed by changing the size of the openings, by varying the forward speed or by changing the operating pressure.

Much information about how and when to apply 2,4-D to field crops was learned from experimental work which has been carried on during the past several years. Using this chemical without the benefit of this information may result in a crop loss or a greatly reduced yield. Consult your county agricultural agent for the latest information about applying 2,4-D before using it this year.

Training a Horse to Do Tricks

Condensed from Western Farm Life

Leon N. Christensen

WILL BARNARD, Utah rancher of northwestern Box Elder county, has spent a lifetime developing and training good saddle horses as a hobby. "Anyone can teach a saddle horse to do many tricks," he says.

"We're not just growing grain here on the ranch," he explains. "We spend our spare time doing interesting things with our saddle horses—training them, mainly for our own entertainment."

Barnard's father, Eszra J. Barnard, arrived in the Salt Lake valley in 1848, following closely on the heels of the first pioneer bands of 1847. He joined the early settlers in the conquest of the desert country. He became a successful cattle and livestock rancher, always with an interest in fine horses.

"I was brought up," Barnard says, "surrounded by some of the finest horses in the country. The horses were well trained, being broken for riding, buggies, wagons, field and draw work. Horses were then the modern way of getting around."

Will Barnard's enthusiasm is typically western. In his pioneering days he went to Rockland, Idaho, to homestead. In 1913, after proving up his homestead, he sold it and purchased a non-irrigated farm in northwestern Box Elder county, Utah. Here he has been successfully following the regular fallow farming practices of seeding the ground every other year. He remembers selling wheat for 18 cents a bushel at Lampo, Utah. Some Idaho farmers used it the same year for fuel instead of coal.

A few years ago Barnard was hitching 16 to 20 horses up to the plows, harrows and other equipment in order to get the farm work done. Preparing the seed bed, planting the crops, and then harvesting them took up most of the time, especially in the summer. In those days it took a lot of sweat, dust and hard work to get the crops in on time.

Today Barnard has a winter home in Brigham City and modern improvements on his farm. The most up-to-date machinery is used to cultivate and harvest his 2000 acres—large tractors,

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Denver, Colorado, April 1, 1949

gang plows, harrows, rotary weeders, drills and combines. The change over from horses to machinery has worked out very successfully, increasing the yield from 5 to 10 bushels per acre.

"Tractors have brought a better way for getting our work done," Barnard says. "They have made possible a lot of shortcuts, giving us more leisure—more time to train our horses.

"It's simple to teach a horse tricks," Barnard says, "and in doing so your horse will become very gentle and you will enjoy him twice as much." According to Barnard's own experience, a horse worth $275 before training can soon become worth twice that much if you should take a notion to sell him and then start training a younger horse.

Horses that do tricks create new interesting pastimes. You can teach your horse to ride the teeter-totter board, lie down as if dead, make a bow, stand on the pedestal posing, play lame horse, fire a gun, and play ball, Barnard insists.

If you are going to purchase a saddle horse, Barnard points out, there are a few good qualities to look for. First, the animal should have good breeding back of him, for he will be apt to have the same disposition as his parents. The principal attention, of course, should be given to the individual himself. The horse should be between 4 and 8 years of age. Horses often give good service for 15 years, but the younger years in the horse's life are the best.

Barnard likes a horse with a good head that is wide between the eyes. The eyes should be sparkling and bright. The ears should be well placed for they denote the disposition of the horse, he asserts. A horse with a Roman nose may prove to be stubborn and give trouble in training.

Barnard points out that the disposition of a horse is influenced by the manner in which he is broken and trained. A person should have a lot of patience and also a determination to have the animal do what is wanted of him.

"If you feed your horse well," Barnard points out, "and keep him well groomed, he will not only look better; he will respond to the good treatment, becoming more gentle and in the training workouts show better response." The horse should be taught simple things at first. Good regular hours of training will be very helpful in the progress made by the trainer.

The "seesaw" or teetering board makes an excellent trick for back yard entertaining, the Utah rancher says. To start the horse into the training, get a long board strong enough to hold the double weight of the two horses. Lay the board on the ground along a fence, so the trainer can teach the

horse to walk on the plank.

After some repetitions the plank is then raised 4 inches in the center. The horse then walks up the plank and tips it when he passes the middle. The plank can be raised another 4 inches and the practice repetitions can be continued until the teeter-totter plank is raised to the desired height. When getting the horse on to the place where the pivot balances, the horse can be moved forward and backward, causing the board to go up and down at the ends.

"Making a bow" is a trick that is appropriate at the beginning of a program, or it can be used when you meet someone along your riding trip. The trick is taught by tying the foot up and pulling the horse down to his knee at the same time. As he is being pulled down, he is caught at the top of the withers and pinched with the hand. After the horse learns the trick, the pinching at the neck is the signal for him to go down. Continuous practice and patience is the secret of getting the horse to do this when the signal is given.

"The end of the trail" is another good trick. Secure four or five 2 by 12-inch planks 2½ feet long. Place these end-to-end along the edge of a fence or barn. Lead the horse around on the board and be sure the horse keeps all of his four feet on the board. After repeating several times, move the boards away one at a time, until there is only one left. Be sure that all four feet are kept on the board.

Barnard taught his horse to play ball with the girls. The ball is placed on the end of a 10-foot stick mounted on a pivot. The horse puts his foot on the opposite end of the stick, which throws the ball. The girls go after the ball. The horse has been taught to stand with all four feet on home base.

"There's nothing difficult about teaching a good horse to do tricks," Barnard insists. "It just takes a little patience and perseverance. The added pleasure you'll get from owning a well-trained horse will repay your efforts many times."

America's Champion Sow

Ninety-six pigs raised to weaning age is the remarkable new record of America's champion production sow. She is Ringold Lady Dora, a purebred Hampshire owned by Meadowlark Farms, Inc. of Sullivan, Indiana, and the only sow of any breed to qualify for an 8th star in production registry books.

The champion chalked up her new record this spring when she raised a litter of 10 pigs, nine of them eligible for registration, to weigh 447 pounds at weaning time, 56 days.

To qualify for production registry, conducted by the purebreed associations, a sow must raise a litter of at least 8 pigs to a minimum weight of 320 pounds within 56 days. They must be approved breed type, free from fault or defect and at least half of them eligible for registry. The sow gains a star in the production registry books each time she repeats the performance.

The champion has repeated it 8 times, raising a total of 81 pigs to weigh a total of 3,183 pounds at the weaning age. Besides her eight litters which qualified for production registry, this sow has raised another 15 pigs in two litters which failed to qualify, or a total of 96 pigs since her first litter was farrowed in September, 1944.

According to U.S. Department of Agriculture reports, the national average is less than 6.3 pigs per litter raised to weaning age. It would take more than average litters to equal in numbers of pigs raised to weaning age what Ringold Lady Dora raised in her 8 qualifying litters.

Worth of her litters was proven recently when her sixth qualifying litter (farrowed February 13, 1948) consisting of 7 boars and 3 gilts, was sold for a total of $4,365.00.

For her last three qualifying litters, which according to hog breeders are admittedly the most difficult records, she was fed a ration containing corn, oats, pelletized milk products, and alfalfa meal or alfalfa pasture prior to farrowing. Her litters have been creep fed early and raised on a ration of 7 parts corn, and 3 parts oats with 8% pelletized milk products added.

The champion is part of a herd of 100 Hampshire sows on the Meadowlark Farms and has been cared for by Herdsman Claude Sisson throughout her last three, and most difficult farrowing periods.

Considering her 96 pigs raised to weaning age as 220 pound market hogs, this sow has produced over 10 tons of pork in her five producing years. She has been bred again with the hope of making the ninth production registry star.

—Kraft Foods Company
Chicago, Illinois

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Hunger Signs in Crops—Published by The American Society of Agronomy and The National Fertilizer Assn. Revised Edition $4.50.

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WALLS AND MEN

Yesterday I was talking with an old country philosopher I know. He was laying a stone wall and commented on the indispensability of small stones to keep the large ones in place to make the wall solid.

"And I was thinkin'," said he, "of the need of small men, like me, to keep the big ones in place. They can't leave a man of us out."

"That's what they sometimes forget," said I.

"Yes, sir, they forget it—but it ain't fer long. Their wall falls down."

From: A COUNTRYMAN'S YEAR by David Grayson.

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